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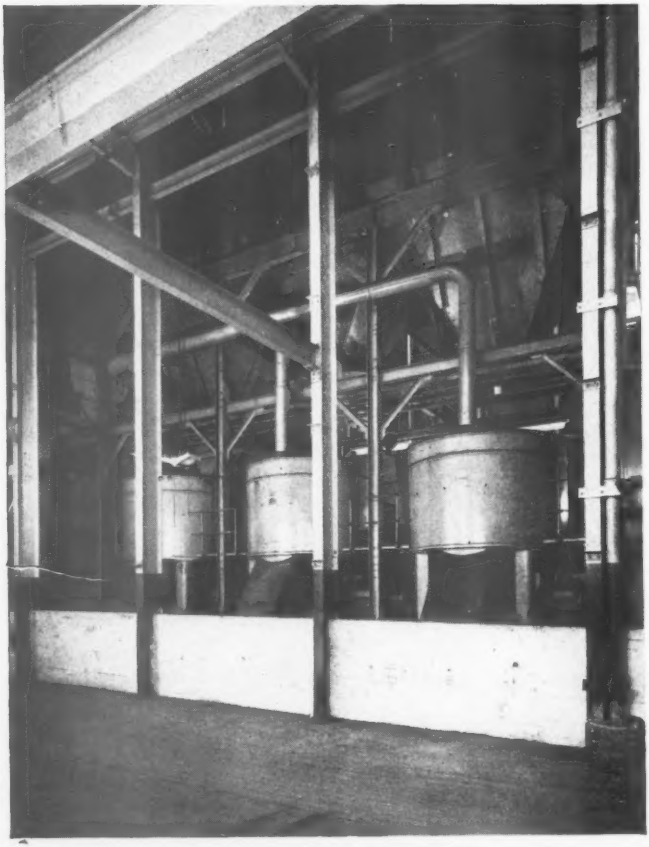

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The MIXING SECTION IN A LARGE IRONFOUNDRY

Photograph shows: Three No. 3F size August-Simpson Mix-Mullers with Returned Cleaned Sand and New Sand Storage Hoppers. A travelling, electrically operated Batch Measuring Hopper (fitted with Weighing device) charges the sand into each Mix-Muller. The Mixed Sand is discharged from the Mix-Mullers on to a Belt Feeder Conveyor for transfer to the Distribution Belt Conveyor.

Photograph published by courtesy of The Hill Top Foundry Co., Limited, Wednesbury.

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FOUNDRY
TRADE JOURNAL

Vol. 105 AUGUST 21, 1958 No. 2184

French Foundry Research

The annual report of the *Centre Technique des Industries de la Fonderie* for 1957, makes interesting reading. It serves the whole of the French foundry industry which turns out nearly 2,000,000 tons of castings, and employs some 100,000 people in 2,000 foundries. The report tells us that no fewer than 68 per cent. of these foundries are in direct and frequent contact with the *Centre*, about 20 per cent. occasionally use their services, whilst 12 per cent., mostly the smaller concerns, have not so far found the need to apply for assistance. This assistance is furnished by a staff of 324 working from Paris and the regional laboratories. Due probably to the efficiency of the service given, the number of consultations was fewer last year (at 6,476) than in 1956 (when it was 6,617). Experience has shown that it is possible to have on file a number of reports which save time in answering queries. Under these headings come such questions as the use of natural gas in foundries, the operation of certain types of melting furnaces (N.G.R.; Morgan; Sklenar), layout of a mechanized moulding shop and so forth.

An activity, which is of a kind similar to that carried out by the British Standards Institution in the issue of " Kite " quality marks, is quite extensive. Known as *labels*, they cover some foundry supplies, some finished goods and a range of castings. In the first field, there are corebinders and blackings; in the second, domestic-heating appliances and light-alloy utensils, and in the third, malleable iron, unalloyed grey iron, light alloys and bronzes and brasses. There is much to commend in this work.

More than half of this 77-page report is given over to research and investigations. Catering as the *Centre* does, for the whole of the foundry, they cover a wide field. One which greatly interested us is headed " Heating in the Solid State in Vacuo," because the practical application envisaged happens to be additional to the one we had in mind. The account of the research reads—" A part of the gas contained in cast iron can be extracted by heating the alloy under vacuum to stepped temperature (from 100 deg. C. in 100 deg. C. steps) from room temperature to melting point. It was found that the release of gas was produced at certain temperature intervals and stopped at others. Thus there was a hydrogen and carbon-monoxide release between 300 and 400 deg. C., stopping between 400 and 500 deg. C., and occurring again between 500 and 600 deg. C. and recommencing again at 800 deg. C. This process allowed the determination of the form in which the gases exist in the solid state (oxide, nitride, etc.) and this has been applied to the study of the thermal treatment of malleable cast iron." The one we had in mind was the case of dies for centrifugal casting, where, when the dies become overheated, unless properly coated, they evolve gas and spoil the casting. This is typical of the useful pieces of information to be found by the meticulous reader in this rather lengthy but very informative report.

Foundry Exhibition 1959

Further reservations have been received for the Foundry Exhibition, 1959, to be held at Bingley Hall, Birmingham, from May 21 to 30, by the following firms: Francis W. Birkett & Sons, Limited; British Aero Components, Limited; Coleman-Wallwork Company, Limited; H. J. Dowler (Engineer's Pattern Makers), Limited; General Refractories, Limited; W. C. Holmes & Company, Limited; Peco Machinery Sales (Westminster), Limited; E. A. Roper & Company, Limited; H. G. Sommerfield, Limited; Spermolin, Limited; Temple Instruments, Limited; and G. & R. Thomas, Limited.

GKN Directors Announce Scrip Issue

The directors of Guest, Keen & Nettlefolds, Limited, have recommended a three-for-10 scrip issue to ordinary stockholders of August 15. The issue will capitalize £9,113,554, of which £8,988,711 will come from share premium account and £124,843 from general revenue reserve.

The issue, it is stated, does not imply any increase in the amount of dividend distribution for the current year, but it is the board's intention to declare in November a 4 per cent. interim on the increased capital as compared with last year's 5 per cent. on the present capital.

An extra-ordinary meeting will be held on or about September 12 to effect the issue and to create 10,000,000 £1 ordinary shares.

Latest Foundry Statistics

Copper-base alloys. During the first six months of this year, the foundries turned out some 1,745 tons less than in the similar period in 1957. The figures given by the British Bureau of Non-Ferrous Metals Statistics for the two periods are 39,041 and 37,293 tons with 5,806 tons made during June. This figure is well below this year's monthly average.

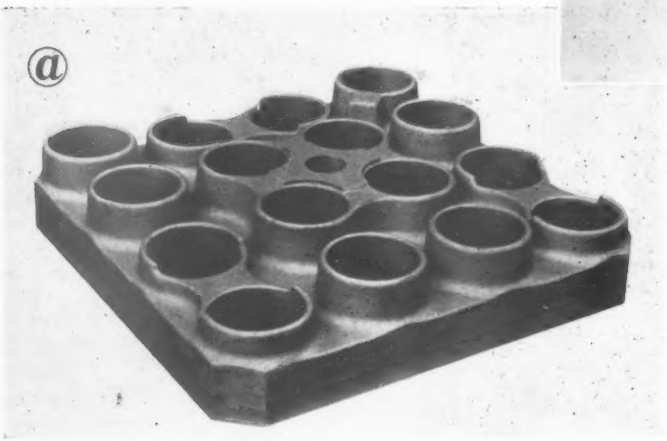
Light alloys. Rather belatedly the Ministry of Supply have just issued the production statistics for May. They show that during that month the foundries delivered 1,409 tons of aluminium as sand components; 3,980 tons as gravity-die and 1,434 tons as pressure-die-castings. It will be noted that the tonnage of pressure-die-castings has now overtaken the sand-cast variety. The output of magnesium castings was 172 tons.

Index to Vol. 104

The index to the JOURNAL, volume 104, covering the period January to June 1958, has now been printed and is available to readers free of charge. Applications for copies should be addressed to the publishing office, FOUNDRY TRADE JOURNAL, John Adam House, John Adam Street, Adelphi, London, W.C.2. Subscribers who wish to receive copies of indices automatically as they are printed may apply for inclusion on a permanent mailing list. Those already on this list should not need to apply for their current copy.

"Atoms for Peace" Exhibition Castings

On *Stand No. 144* in the British section *(Hall A)* of the "Atoms for Peace" Exhibition which opens at Geneva on September 1, the A.P.V. Group have arranged a combined stand with the A.P.V. Company, Limited, exhibiting fabrication work in aluminium and stainless steel, and their foundry, A.P.V.-Paramount, Limited, exhibiting castings in stainless and special alloy-steels. The latter company show one of the reactor guide-pan steel castings illustrated at (*a*) supplied to the General Electric Company, Limited, and Simon Carves, Limited, for the Hunterston nuclear power-station and also lantern and plug castings in stainless steel for the Bradwell nuclear power-station. In addition, castings



are to be shown in a series of corrosion and heat-resisting materials for other nuclear-energy projects. Also included are examples of the extensive range of "Paralloy" "forging-quality" cast stainless and alloy-steel pipe-fittings (*b*) which are now being supplied on an increasing scale to the chemical and petroleum industries. It is claimed that these fittings have a considerable price and delivery advantage over wrought products.

Simplex Electric Company's Foundry in South Africa*

By F. D. Nash

An extension to the Simplex Electric Company's foundry in South Africa has recently been completed. These extensions became necessary due to the demands made by customers, and it is felt that a very brief history of the company's foundry activities will be of interest to JOURNAL *readers.*

History

The factory of the Simplex Electric Company (South Africa) Limited is situated in Springs, a town some 40 miles from Johannesburg. It commenced operation in April, 1952. The necessity of making a large number of thin-walled castings for the company's own switchgear meant that a mechanized foundry was desirable, and once this fact was accepted, a certain minimum size was dictated by pure economics. It was decided, therefore, to instal a small plant, and to sell the balance of the output after the company's own requirements had been met, although it was realized that fierce competition already existed in the foundry industry in the Union. After some initial difficulties, a satisfactory loading was obtained, the principal successes being obtained in the thin-section and light-casting field. By insistence on rigid sand control and the preparation of special facing sands, better finishes were obtained than had been available previously in the Union. It was also part of the policy of the foundry to offer closer limits on castings, and in some cases, customers were able to abandon machining operations that had previously been considered to be necessary.

As might have been expected, the volume of business grew, until it threatened to exceed the maximum output of the foundry, even when considerable overtime was being worked. The difficulties of running full 24-hour shifts were found to be considerable, and the company was finally compelled to extend the foundry. It was decided to take full advantage of this decision by increasing the size and weight of castings made as well as the general volume and larger machines were installed. It is of interest to note that the increased capacity made available by the extensions has already been fully taken up, and considerable overtime has again been introduced to meet ever growing demands.

Metal Melting

The original melting plant consisted of two acid-lined cupolas (Fig. 1) delivering three tons per hour, and used on alternate days. A new 4½-ton per hour furnace, also acid lined, was introduced as a part of the recent extensions. This addition not only permits an increased melting rate, but also allows more flexibility in that more than one grade of iron can be melted at one time. Volumetric control of air input for all three cupolas is effected by means of calibrated venturi intakes to the blowing fans, humidity being relatively constant on the Highveld. Syphon bricks are used with the cupolas.

Raw materials are received by rail and charges are loaded direct from the storage bins into the final charging skips. This is achieved by the following method:—The weighing machine with the empty skip located on it is mounted on a bogey and runs on rails which traverse the material bins. The skip is charged manually as it progresses past the various

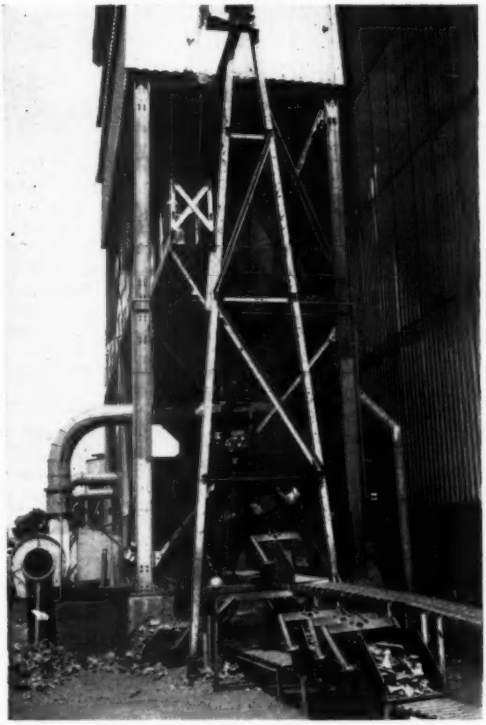


FIG. 1.—*End view of the battery of cupolas and charging arrangements at Simplex Electric South African foundry. Note the blowing fans at ground level on the left-hand side.*

*Since this article was written, an announcement has been made to the effect that Simplex Electric (South Africa) has merged with Henley's Telegraph Works, Limited, in South Africa. The name of the company is now Henley-Simplex Africa (Pty.), Limited.

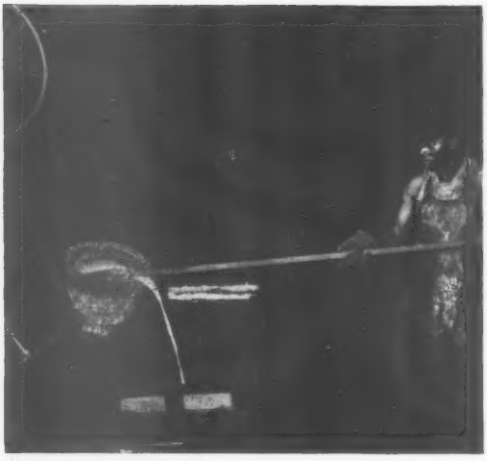


FIG. 2.—*Pouring moulds while on the pallet conveyor from runway-supported ladles adjustable for height by rack-and-pinion gearing.*

materials and is finally transferred to a gravity conveyor, along which it runs until it is in a convenient position to be picked up by the furnace charging hoist. This electrically-powered hoist is operated from the cupola-charging platform and runs on a monorail, designed so that all three cupolas can be charged from it.

After the skip has been lifted and traversed to the appropriate cupola, the hoist is lowered and the charge is automatically pro-

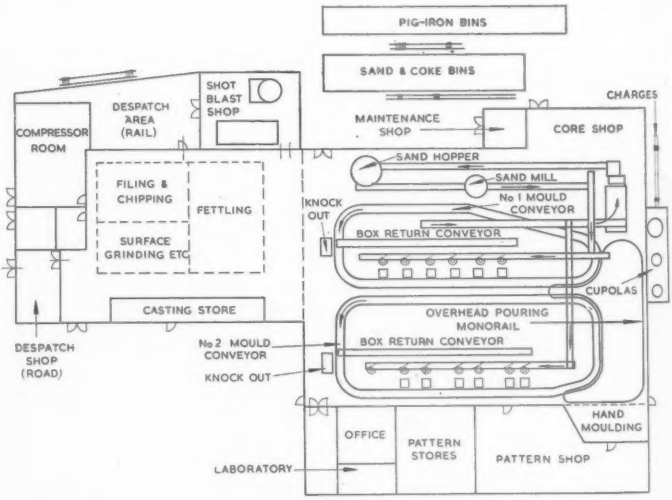


FIG. 3.—*Layout drawing of the Simplex foundry extensions in South Africa, showing the relative location of the various sections.*

jected into the charging chute as the skip strikes against a knocking bar. The empty skip is then lowered on to a second gravity conveyor, along which it runs and is stored until it is again picked up by the travelling weighing machine. This very simple semi-mechanized system has proved to be very effective—and utilizes the minimum labour force. To complete the description of the melting equipment, it is worthy of note that the foundry is one of the very few in the Union to have dust-arresting equipment associated with its cupolas.

Metal Pouring

African labour is used entirely for casting moulds, and this has meant that the pouring process has had to be made as foolproof as possible. The aim has been to avoid any possibility of cooling of molten metal, and, at the same time, to prevent the operation from becoming too arduous. After considerable experiment, a system has been evolved which meets both requirements. Metal is received from the cupolas in ladles, each holding 180 lb. of molten metal. These ladles are suspended from and run on a monorail. This same monorail runs alongside part of each of the two mould conveyors, and moulds are poured directly from these ladles, thus avoiding the necessity for any transfer of metal (Fig. 2). The height of the ladles is adjustable through a simple handwheel, pinion and rack arrangement, so that the varying height of moulds can be catered for. Hand skimming during the pouring operation is found to be advantageous.

Mould Conveyors and Moulding Machines

The foundry proper is fully mechanized (see layout Fig. 3) and the output achieved compares very favourably with that obtained in similar plants in the UK. Two continuous pallet-type conveyors are installed, the faster one being some 243 ft. in periphery and runs at 15 ft. per minute, and the slower one being 232-ft. long, running at 7 ft. per minute. A rearrangement of moulding machines became possible as the result of the decision to extend the factory, and all light section castings are now made inside the faster track on B.M.M. jolt/squeeze stripper and jolt/squeeze turnover machines.

Inside the slower track there is a combination of British Moulding Machine Company's J.S.S. and J.S.T. machines, and a larger pair of Zimmermann machines. Castings up to 250 lb. in weight and

FIG. 5.—*Section of the fettling shop showing the types of castings produced and the quite elaborate dust-extraction arrangements.*

requiring box sizes up to 31 in. by 48 in. are made on these latter machines. A Gibson roll-over machine is also installed in close proximity to these large machines, and is used in conjunction with one of them when very deep draws are required.

The general practice in the foundry is to use a jolt/squeeze turnover machine to make the drag mould, and a jolt/squeeze stripper machine to make the cope mould, the closing being effected on a steel table adjacent to the mould conveyor. With the smallest size moulds, however, jolt/squeeze stripper machines are used for both cope and drag moulds wherever possible.

Sand Plant

The original sand plant was conservatively designed, and has been extended to serve the expanded foundry, with the addition of a relatively small increase in sand-storage capacity. The main storage hopper is equipped with a rotary discharge table, which feeds sand on to an elevating conveyor and takes it to the Foundry Equipment S.B. 3 continuous sand mill. Synthetically-bonded sand is used throughout, and the necessary bond and sand additions are fed in through vibratory actuated hoppers before the sand reaches the mill.

A further series of conveyors lifts the milled moulding sand to the two distributing conveyors, each of which is equipped with an aerator. This latter consists of a steel drum, to which vans are welded, and rotates at a very high speed within its steel casing, and serves to break up the sand before it reaches the moulding machines. Over each machine there is a fabricated circular hopper, which is spring mounted from the distributing conveyor framework. Sand is fed into the hoppers by the operation of individual ploughs, and an additional ploughing-off rake feeds conditioned sand to a discharge chute for use by the hand-moulding section. Each hopper is fitted with a hand-operated duplex gate valve at the bottom, and has a vertical operating handle.

Spillage conveyors run in underground pits in line with the moulding machines, and surplus sand from the hoppers falls through suitably placed grids on to these conveyors which take the sand and transfer it to conveyors which run under the shake-outs.

It is, perhaps, convenient to describe the push-off and shake-out arrangements under the heading of sand plant. The push-offs are of the single-cylinder pneumatically-operated

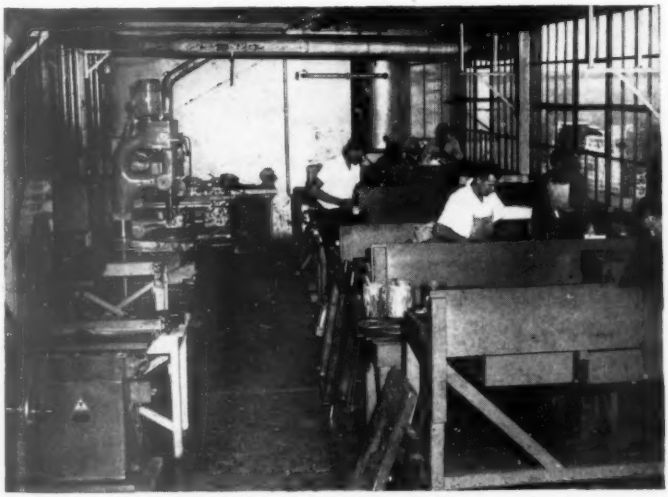


FIG. 4.—*Section of the Simplex patternshop. Note the quite orthodox arrangement of pattern machinery on the left-hand side and individual benches close to the windows.*

type, and are fitted with two guide arms which run in brass bushes. The mould, having cooled on its mould-conveyor track after pouring, is put on to the shake-out grid by the operation of an air valve which actuates the air cylinder of the push-off. The shake-outs are of "Sterling" manufacture and are vibrated by virtue of the fact that the rotating shaft is out of balance.

At the shake-out, the castings are taken away for inspection and shotblasting, and the empty moulding boxes loaded on to a roller conveyor which returns them to the moulding machine. The hot sand falls through the grid on to a mica-inlaid rubber conveyor which, in turn, discharges on to an elevating conveyor taking the sand to the first stage of the cleaning and reconditioning process.

The elevating conveyor delivers the used sand to a grizzly screen which sorts out and rejects large lumps of coresand and the larger pieces of tramp metal. The sand then passes to a hexagonal rotary screen which serves to reject the remaining lumps of coresand, medium-sized pieces of tramp metal, and those lumps of moulding sand which have not been broken up in it. A tailings chute carries away these rejects for sorting and the cleaned sand is delivered to a conveyor which passes under a magnetic separator of the overband type. Here the smallest pieces of tramp iron, core irons and nails are removed.

The sand, which has now been almost completely cleaned by the three pieces of apparatus mentioned, is delivered to an elevating conveyor and taken into the main storage hoppers. Thus the entire cycle of the sand through the plant is completed. It will be seen that the process is completely mechanized and, with the exception of the feeding in of new materials, the entire operation of circulating the sand is achieved by the use of conveyor belts.

All the conveyors in the two plants are controlled by interlocking starters, to prevent individual units being stopped or started out of sequence. The starters for the associated equipment, *e.g.* the sand mill, magnetic separators, etc., are also interlocked into the system. By means of this system choke-ups are avoided, and, for example, should the rotary screen go out of action for any reason, the whole system of conveyors feeding to it would be automatically tripped out. All the starters are mounted on centrally-situated control panels, which simplifies fault finding. The design and construction of all the sand plant for both the original and extended foundry, as well as the supply of the mould conveyors, was by Patterson Hughes Engineering S.A. (Pty.) Limited.

Pattern and Moulding Boxes

Virtually all the patterns used in the foundry are made in the company's patternshop (Fig. 4). Fully-machined, jig-drilled, cast-iron patternplates are used for all but the very short runs, and steel moulding boxes of "Sterling" manufacture are used throughout. The replaceable bushes in these boxes are checked for size at regular intervals, and the patternplate and closing pins, which are made from hardened Nitralloy, are checked daily. A maximum wear allowance of 0.007 in. only is accepted on both types of pins.

The patternshop is fully equipped with both wood- and metal-working machine-tools and whilst a certain amount of semi-experimental work is carried out using newer processes, the majority of the patterns are produced by means of the wooden master and green-sand moulding method. Nearly all production patterns are made in aluminium, bronze being used only where exceptionally large quantities are involved.

Laborotory

The fully-equipped laboratory is under the control of a senior qualified metallurgist. In addition to the usual control of the composition of charges, metallurgical analysis and sand control, the laboratory staff is available to advise customers on the most suitable grade of iron for their castings.

Fettling Shop

Castings are taken mechanically from the two shake-outs to the fettling shop (Fig. 5). Two shotblast machines are installed, the larger being a Tilghman WTB 2 type, and the other a rotary-table type machine. After shotblasting, all castings are inspected and are fed to a row of double-ended pedestal grinding machines for profile grinding. From this stage onwards, the castings are not put on to the floor or trucked until they leave the fettling shop. After profile grinding, the castings are put into pans, which run on roller conveyors, and the work passes to other machines for slot grinding, surface grinding, internal grinding, chipping and filing, as necessary. Small castings are barrelled, wherever possible. Extensive use is made of high-frequency portable electric grinding and surfacing machines for fettling larger castings. After all the fettling operations have been completed, a final inspection takes place before the castings are sent away to the despatch bay or into the machine shop.

Clean Air Act and Fuel Efficiency

In his July report to the board, Dr. W. Angus Macfarlane, managing director of the National Industrial Fuel Efficiency Service, says that new contacts were made with 120 firms, representing a total annual fuel consumption of 106,963 tons.

With the coming into force of the remaining provisions of the Clean Air Act on June 1, the inquiries of industry, institutions, and local authorities had shown a marked increase, in many areas the local authority taking the initiative and inviting representatives of local industry to meet their chief public health inspector together with a representative of NIFES.

Drop in Unemployment

For the second month in succession the number of unemployed has fallen—from 429,257 in June to 411,838 for the four weeks ended July 14. There were 447,556 unemployed in May and 244,306 in July, 1957. Expressed as percentages of the total employed, July was 1.9 per cent., June, 2 per cent., May, 2.1 per cent., and July, 1957, 1.1 per cent.

There was also a slight increase to 215,000 in the number of unfilled vacancies and at the end of June the numbers working short time had dropped by 29,000 to 188,000. The fall in unemployment is normal for this period of the year.

European Investment Casters' Association

Fifth Conference held in Paris

Investment-casting developments in many fields provided the major theme of papers presented at this year's EICA meeting held in Paris. Below is a brief survey of the programme and principal features of the conference; it serves as a prelude to detailed reports appearing in this JOURNAL which will embody the papers and discussions. The JOURNAL is privileged to be accorded the status of official organ of the European organization.

Mr. H. J. Meerkamp van Embden, EICA president, outside the premises of the Cercle Interallié in the rue du Faubourg St. Honoré, where the conference was held.

The annual conference of the European Investment Casters' Association was held in Paris early this summer; some 75 members (from all countries in Western Europe and also three guest delegates from the USA) participated, including a quite large contingent from the UK. An innovation of this year's proceedings was a presentation of castings submitted by participants with a view to bringing into focus the present-day scope and application of the lost-wax casting process and "highlighting" specific problems overcome and developments in technique; this formed the basis of a competition for which two diplomas were awarded.

Opening Session

The congress was given an informal send-off when delegates and their ladies met on the Sunday evening for cocktails, by courtesy of their French hosts, the Société des Aciers et Forges de la Loire, at their offices in the rue Taitbout. At this gathering, members were presented with conference literature, programme details, tourist information, and badges to wear during the assemblies. The badges themselves comprised an investment casting to hold a card carrying the member's name and these were furnished by Mr. Lefranc from the Maprodent concern in Paris. An official address of welcome was given to the assembly by Mr. H. J. Meerkamp van Embden (of NV Philips' Gloeilampenfabrieken) who, at last year's meeting in Stratford-on-Avon, had been elected president. Mr. Meerkamp van Embden was accompanied by his wife and the occasion served for delegates to renew acquaintances made at earlier conferences and make new ones.

On the following Monday morning, the technical sessions began in the spacious and dignified premises of the Cercle Interallié, in the rue du Faubourg St. Honoré. Here the chairman welcomed the participants and made particular mention of Mr. R. F. Waindle, Mr. McClelland and Mr. H. P. Gray from the USA who were joining in the proceedings. The chairman also made reference to the invaluable assistance given to him by Mr. P. Chevé and the staffs of the host organizations in the arranging of accommodation and the whole programme of the congress and offered these gentlemen his grateful thanks. (Throughout these proceedings and those which followed, there was instantaneous translation—by means of transmitter and earphone receivers—into one other language of the conference of all the conversation (according to whether the speaker used English, French or German). At the same time, the president interjected in the third language a resume of all that was said and did this remarkably well. Thus delegates with a knowledge of any one of the three major languages used were at all times able to follow the proceedings—a most valuable attribute for a conference of this type. (The equipment for instantaneous translation was provided by courtesy of Philips N.V. Eindhoven). In addition to the instantaneous translation service in the second language and the president's impromptu translation into the third language, all the proceedings were tape recorded and these proved of great value in subsequently obtaining discussion contributions which are to be incorporated in the written "proceedings" of the conference.

Welcoming Address

Mr. J. Pomey, director of research of the Regie Nationale Renault, then gave an official address, welcoming members to the French capital city. This, he said, was the fifth congress of the Association and after successful congresses in Zurich, Eindhoven, Stratford-on-Avon, it was very pleasant to be back again in Paris where the Association was born. Mr. Pomey thanked Mr. Meerkamp van Embden for having invited him to give the address of welcome and paid tribute also to Mr. Chevé and all the organizers who had done such a magnificent job. He also thanked the dozen or more lecturers who had travelled from Great Britain, Germany,

European Investment Casters' Association

the USA, France, Italy, and Switzerland for the purpose of imparting knowledge.

Looking back over the previous year's proceedings, Mr. Pomey said, all phases of the Association's activities seem to have been covered by the most eminent specialists. However, he was hoping to put forward a few personal thoughts for consideration about particular problems of casting. For example, there was an increasing number of investment processes and it seemed that several new combinations had not yet been experimented with, though appearing to offer good prospects. For example, the steel industry had found great benefit from vacuum melting and casting, in order to improve the quality of the steel. Using plant well adapted to this type of work, for example, it was now possible to keep a one-ton capacity induction-type furnace under vacuum during all the successive operations of pouring a number of ingot moulds until the melting crucible was empty. These included loading the furnace, putting in alloy additions, reading the temperature by immersion thermocouple, introducing the ingot mould through a "lock," tilting the crucible for pouring and taking out the ingot also through the lock.

In the future, one could visualize all the moulds for one investment-casting pouring operation being lined up on a carriage and taken out of the preheating furnace, then this carriage with its moulds coming into the chamber of the lock which contained an electrical-resistance tunnel-type furnace, to bring the moulds up to the temperature required for the casting, while the metal was being vacuum melted in the induction furnace. As he saw it, vacuum could be produced in the chamber of the lock, then, opening the gate which communicated with the furnace body, when appropriate, the carriage could be pushed in so that the moulds arrived—one after the other—under the furnace spout for pouring. Next, the carriage would be brought back through the lock, then out of the furnace, in order to prepare for another operation. It would thus be possible to obtain improved castings of high-performance alloys, such as gas-turbine blades, made with nickel- and cobalt-base alloys and containing accurately made additions of elements, even those which were very easily oxidized, such as aluminium, titanium and boron. Similarly, it would become possible to carry out titanium-alloy casting.

Adaptation to Precision Casting

Thus, with investment casting, it was possible that the same sequence of operations could be carried out with, in addition, the heating of moulds and, in future, this would extend the precision-investment casting process to other alloys and other firms not previously using it. All the various developments in investment casting made for progress, but it must be borne in mind that they were in competition with all the other processes of forming and casting metals, plastics manufacture, etc. Automobile parts, for example, either needed a dimensional tolerance smaller than the lowest possible tolerances obtainable by precision casting or, alternatively, much wider tolerances. In the former case, for example, when fitting a shaft in a bearing, the necessity for machining the bore made it necessary that the parts should have a machining allowance of such order as not to profit from the accuracy of the lost-wax process. In the second case, the tolerances required were intermediate between those of ordinary casting and lost-wax casting, but in both cases, it was important not to try to get the utmost accuracy which could be obtained; "just enough" only was required, in

General group of delegates to the European Investment Casters' Association conference in Paris photographed in the courtyard of the Cercle Interallié. Mr. P. Chevé, who organized the conference, is fifth from the left in the front row (dark suit).

Part of the large UK contingent attending the EICA conference in Paris. From left to right (front row) Mr. L. S. Taylor (G. L. Willan, Limited); Mr. W. F. Foyers (H. & F. Precise Castings, Limited); Mr. R. W. N. Danielsen (Deritend Precision Castings, Limited). From left to right (back row) Mr. D. E. Hope (Monsanto Chemicals, Limited); Mr. G. L. Willan (G. L. Willan, Limited) and Mr. W. J. Humphreys (Deritend Precision Castings, Limited).

order to lower the cost as far as possible.

Finally, Mr. Pomey mentioned how rich Paris was in "lost-wax" ornamental statuary castings—both ancient and modern—and delegates might wish to view some of these. He referred, for example, to the Chinese daggers, large food-vases with verdigris patina, small vases with three hollow feet, beautifully ornamented, dating from the Shang period (fourteenth and eleventh centuries BC) which could be seen in the Cernuschi Museum. In the Louvre Museum, he said, there was a whole glass case displaying Egyptian cats, funeral statues, *ex-voto* dedicated to the goddess Bastet, dating from the Saite period (sixth and first centuries BC).

At its conclusion, Mr. Meerkamp van Embden thanked Mr. Pomey (in French) for his most interesting address.

Technical Sessions

The first paper on the technical sessions was presented by Mr. L. S. Taylor (of G. L. Willan, Limited) entitled "Some Aspects of the Quality Control of Investment Foundry Melting Stock." Then followed a discourse by Mr. J. Aherne Heron (of Trucast, Limited) entitled "What is Wrong with Investment Casting." To complete the first technical session, Mr. Marinier (France) spoke in the afternoon on "Experiences in the Precision Foundry of Regie Renault" and Mr. H. J. Marshall (of Nicholas Hertzmark, Paris) showed three films and gave detailed commentaries and descriptions of each. These were entitled: "Austenal Process in the US at the Dover Works," "Shaw Process as Modified," and "New Process 'Plyshell' Production." Before the session closed, but after a break for tea, a film, made personally by Mr. P. Mathy (of Société Anonyme Usines Gilson, Belgium) of some of the proceedings at the Stratford-on-Avon conference was exhibited and this brought back many nostalgic memories to those delegates who were fortunate enough to have been present.

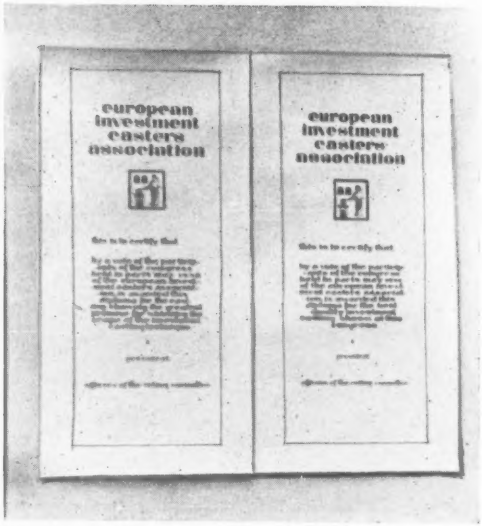
Next, the president referred to forthcoming matters to be dealt with during the present conference, and relating to standardization and particularly the proceedings of the relevant International Standards Organization committee in Geneva, about which letters were read concerning (*a*) alloys and (*b*) dimensional tolerances. Here, it was suggested that national committees of investment casters should submit their countrymen's proposals. Mr. Meerkamp said this matter should be pushed forward immediately and a small committee was needed for the EICA to keep contact with the standards' representatives of the various national investment casting associations and also that these national committees should work with ISO through their national standards institutions.

EICA Standards Representative

Mr. Meerkamp then reported that Mr. di Sambuy had resigned from the representation of the EICA on the relevant committee of the ISO and suggested that Dr. E. G. Nickel, of Germany, should be asked to serve in his place and act as convener of the Association's representatives in different countries. This proposition was accepted, with applause, and Dr. Nickel agreed to serve in this capacity.

Dr. Nickel then explained the position in Germany on the way in which standards were organized in relation to investment casting and reported what had already been done and what ground covered. For normal steels and 18/8 stainless types, he reported that proposals had already been collected for putting before the German Standards Organization (DIN), but it was necessary also to bring in the somewhat "difficult" (to cast, that is) 13 per cent. chromium steel to cover particular castings made, for example, those for blading of turbines, etc.

Mr. L. N. Hocking (of Trucast, Limited) said that as far as the United Kingdom was concerned, the British Standards Institution proposed three main types of steels should be covered initially for investment casting, (*a*) chromium and low-alloy steels; (*b*) stainless steels, and (*c*) heat-re[illegible]sting steels. The president said that he hoped the other



Diplomas awarded at the Paris meeting of the EICA for castings exhibited. One diploma was given for the casting showing the greatest promise and the second for the best-quality casting. The former was awarded to Firth-Vickers Stainless Steels, Limited, and the latter to Microfusion of Paris. The actual citations are as follow: "This is to certify that . . . Firth-Vickers Stainless Steels, Limited . . . by a vote of the participants of the congress held in Paris, May, 1958, of the European Investment Casters' Association, is awarded this diploma for the casting showing the greatest promise for widening the scope of the investment casting technique." The second diploma is similar except that it is awarded "for the best-quality investment casting shown at this congress," and (as stated) Microfusion of Paris were the winners of this section. Both diplomas are signed by Mr. H. J. Meerkamp van Embden as president, and by Mr. J. Mermillod and Mr. A. Ternollet, as officers of the voting committee.

national standards representatives would come forward with proposals to the joint EICA standards committee.

EICA Membership and Constitution

Continuing the business meeting, Mr. Meerkamp said that it was necessary to consider applications received for membership of the EICA and proposed that new members should only be admitted by unanimous approval by existing members. After some discussion, this was agreed to. On the question of separate grades of membership to cover commercial delegates, it was decided there was no need yet for any separation of interests—although it was known that separate sessions were considered expedient in the USA investment casters' meeting—and the EICA would carry on with the annual general meetings as at present. He exhorted members to try to get into touch with their national representatives on various other European associations, such as NATO, the European Coal and Steel Community and the European Free Trade Area, and various industrial federations, so as to explain what the investment casters were doing to bring about technical and commercial accord on an international basis. He also emphasized that members should spread news of the techniques and achievements of precision castings as wide as possible.

Future Organization

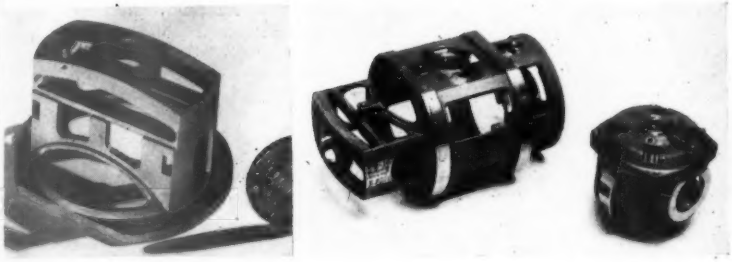
Referring to the organization of the EICA itself, Mr. Meerkamp van Embden referred to the first conference in Paris, where the plans for a strict and "closed" organization were rejected—the result being that a quite "loose" directing body, consisting of a president and a rather vague group of "contactmen" was chosen. Mr. Meerkamp said that in his opinion some sort of more definite organization would have to be formed in the future and with at least a part-time secretary and some cover arranged for the costs for correspondence, printing and stamps—to be paid for by the members. Various possibilities in this direction were open between the existing loose bond and very strict articles of association, as was the case in the American ICI, and members were requested to think these over and to ponder about the form and amount of a yearly contribution (per firm or according to the number of employees). An opportunity, Mr. Meerkamp said, would be given to members later in the conference to "air" their views.

Next, the president referred to "The Book"—the annual proceedings of the EICA—and mentioned the offer of the FOUNDRY TRADE JOURNAL to continue to operate as the Association's official organ and make available, from their typematter, copies of the various contributions for subsequent binding into annual proceedings (much as had been arranged for the Stratford-on-Avon conference). This, members accepted very gratefully and the assurance was given that if an author did not wish for his paper to be published in this way, it would be omitted.

Tuesday's Session

Tuesday's technical session opened with the president giving a brief resumé of the rest of the programme arrangements (including the competition to be held for the award of two diplomas, one for the best casting of the year and one for the best application of investment casting process). Mr. Meerkamp mentioned that an offer had been received for next year's conference to be held in Germany and possibly for one to be held in Belgium in 1960.

The second day of the conference was again mainly occupied with technical sessions, when five papers were presented. These were as follow: "Comparison between Cast and Wrought High-speed Tool-steels," by Dr. K. Krekeler (of Gebr.



EICA diploma-winning casting (left) made by Firth-Vickers Stainless Steels, Limited. It is one of five comprising the structural framework of an "artificial-horizon" gyroscope, the five components after machining and part assembly being shown, right.

Böhler AG, Düsseldorf); "Development of Corrosion-resisting Investment Castings for Heavy-duty Applications," by R. Taylor (Firth-Vickers Stainless Steels, Limited); "Review of Development of Investment Casting," by A. Dunlop (of Foundry Services, Limited); "Survey of American Investment-casting Activities," by H. P. Gray (of Gray-Syracuse, Inc.); "Metal Specifications and Melting Practices in USA," by M. Waindle (of WaiMet Alloys Company, Detroit), and "Measurement of Temperatures of Cast Metal," by Mr. J. Mermillod (of Durox GA, Geneva).

Diploma Competition

At the end of this session, the presentation and exhibition of castings by the various manufacturers followed. Time restrictions dictated that each of the seventeen exhibitors could only be allotted about 2½ minutes during which the sponsor could give the background details of the castings submitted. Subsequently, after inspection by the representatives present, a secret ballot was taken for the award of two diplomas. One of these was won by Firth-Vickers Stainless Steels, Limited, and the other by Microfusion of Paris. The first diploma was given for the casting showing the greatest promise for the development of the investment-casting process, and this (for which the diploma awarded to Firth-Vickers Stainless Steels, Limited), was judged as being the "artificial horizon" gyroscope casting exhibited. It was one of a set of five which, after minor finishing—machining, drilling and tapping of holes—constituted, on assembly, the chassis or structural framework of an aircraft instrument. (In cases there was only 0.0002 in. clearance between parts assembled as cast and if produced otherwise than by investment casting, the whole job would be uneconomic and virtually impossible, it was stated). When this type of component had previously been made as aluminium die-castings, the stresses of high-speed flight had resulted in mass-shift or flexure of the instrument framework, due to inadequate strength and rigidity. To overcome this, a non-magnetic alloy-steel was called for and the die-casting process could not be used. The greatly enhanced strength of the alloy-steel components permitted considerable rationalization of design and a much higher and valuable framework/space ratio for the electrical system, etc. The second diploma—for the best-quality investment casting shown—was won by the casting submitted by Microfusion of Paris, which comprised a gearcase casting for the Caravelle aircraft, weighing 3½ lb.

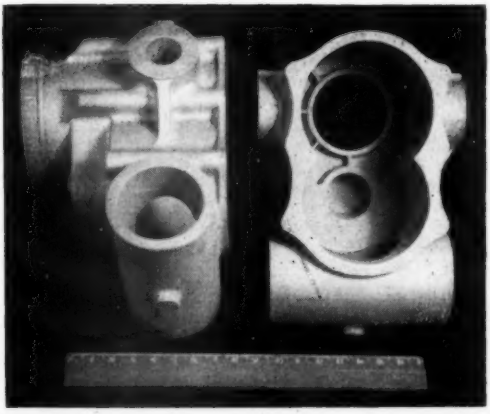
Other Notable Exhibits

Other submissions for the competition included the following:

(*a*) Two simple Maltese-cross castings, put forward by Microfusione d'Italiana, as exemplifying the best application of the process. These were for service in the gearbox of a motor scooter and were used as-cast, to a tolerance of plus 0.25 mm. each and 0.38 mm. the pair. Here, it was reported that the most difficult part of the job had been not to make the castings, but to convince the client to accept an as-cast job. This firm also showed a complete pistol body as an entry for the diploma for the best-quality casting.

(*b*) The Durox concern put forward a sizeable component where section varied from as small as

Diploma-winning casting submitted by Microfusion of Paris. It is a gearcase for the Caravelle aircraft, made in alloy 30 *NCD* 16 *and weighing* 3½ *lb. The tensile strength of this material is* 60 *tons per sq. in. with the yield point at* 53 *tons and reduction in area* 18 *per cent.*



2.5 mm. to quite substantial dimension. This had been achieved by welding together two investment castings.

(*c*) From the Sulzer foundry came a turbine-rotor casting designed to run at 70,000 r.p.m. at 600 deg. C. for a radio-controlled mechanism.

(*d*) Mr. J. L. Gwynn, of P. I. Castings (Altrincham), Limited, put forward a bottle-opener as a quality casting—it was used as an advertisement for the firm.

(*e*) Mr. W. J. Humphreys, Deritend Precision Castings, Limited, showed an austenitic heat-resisting steel assembly (for the body of a pressure-regulating device for aircraft). It consisted of five separate castings and was an example of what could be done if designers took advantage of the freedom conferred by the casting process. Here, only a bare minimum of machining—turning, drilling and tapping—had been required before assembling the castings by palladium-alloy brazing.

(*f*) Fürstlich Hohenzollernsche Hüttenverwaltung (Mr. Blank) showed a low-alloy steel casting where reduction of machining was the major claim.

(*g*) Hadfields, Limited (Mr. N. Walker) extolled the virtues of a hollow-nozzle guide-vane casting, made in cobalt alloy, for which a special core-making technique had been used.

(*h*) Mr. M. Riddihough (Deloro Stellite, Limited) showed a diffuser-plate casting, also made in a cobalt-base alloy, for which a particular feature was that the section was so complicated that it was difficult to get the wax out.

(*i*) Dr. Ing. R. Schwalbe (Zentroguss) showed a lantern slide of a gear component for a motor-cycle used as-cast. It was 60-mm. long by 50-mm. dia. and was a good example of the virtues of precision investment casting process.

(*j*) Mr. B. J. Helders, of N. V. "Industrie," showed two precision castings in a silicon-copper alloy for electrical purposes, together with a brass composite assembly which they replaced.

(*k*) Mr. W. Foyers, of H. & F. Precise Castings, Limited, exhibited two castings where a change of section and difficult core location provided the chief interest and where controlled grain-size had been secured in the castings.

(*l*) Mr. L. N. Smith, of Trucast, Limited, showed a spray of gas-turbine blades about 5-in. long, made in Nimocast alloy to the usual aircraft-blade tolerances. Here the problem had been preventing movement of the long cores which were without support or reinforcement. Good yield and good use of mould volume had been secured which, considering only virgin metal could be employed, had resulted in a very desirable economy.

(*m*) N. V. Philips Gloeilampenfabriken showed a spider-type of electrical contact-piece for making fluorescent tubes and which worked at 700 deg. C.

(*n*) Mr. Schneider, of Le Creusot, had on view a hollow-blade casting employed at 900 deg. C. and which was subject to extreme vibration. For a casting best showing the application of the lost-wax technique, he produced a wheel casting in carbon-free 13 per cent. chromium steel.

During the informal dinner that evening, also held in the premises of the Cercle Interallié and presided over by Mr. Meerkamp van Embden, the diplomas were officially presented. The award for Firth-Vickers Stainless Steels, Limited, was received on the firm's behalf by Mr. R. Taylor of that firm and the diploma for Microfusion by Mr. R. Roques. Delegates' ladies were present at the dinner, which was prefaced by cocktails, the whole forming a most agreeable interlude in the quite heavy business programmes of the conference.

Final Technical Sessions

On the Wednesday, the final technical session of the conference was held, the papers presented being: "Behaviour of Investment Castings at Low Temperatures," by Mr. di Sambuy (of Microfusione d'Italiana)—in the absence of the author, this contribution was read by Mr. Meerkamp van Embden; "Aspects of Investment Casting Experience," by Mr. N. Walker (of Hadfield's, Limited, Sheffield); "Typical Defects in Precision Casting," by Dr. E. G. Nickel (of Deutsche Edelstahlwerke, Germany), and "Influence of Heat-treatment on the Mechanical Properties of a Complex 13-per-cent. Chromium Alloy for Investment Castings," by H. Schneider (of Sulzer Bros., Switzerland).

This concluded the technical activities of the conference and Mr. Meerkamp van Embden closed the proceedings by expressing members indebtedness to all the contributors and by giving special thanks to Mr. J. Gamard (of Usines du Nord) for his valuable assistance with the simultaneous translation services during the conference session. The final afternoon of the conference was spent by a number of delegates in a tour of the Flins works of the Renault concern. At its conclusion, thanks were expressed on behalf of the visitors for the courtesies extended to them by their hosts, and for the assistance rendered by Renault staff—along with the staffs of other French firms—in organizing and carrying through the programme of the conference.

Exhibitions on Practical Uses of Nickel Alloys

A series of four-day exhibitions devoted to the practical uses of nickel and its alloys are to be held in Newcastle-upon-Tyne, Leeds, and Belfast, during September and October by Henry Wiggin & Company, Limited. The first will be at the Royal Station Hotel, Newcastle, from September 23 to 26; the second at the Metropole, Leeds, from October 14 to 17, and the final one in this series will be from October 28 to 31 at the Grand Central Hotel, Belfast.

The exhibition will include lectures, film shows, and comprehensive displays illustrating the various properties of the Wiggin alloys—corrosion resistance, high-temperature properties, electrical resistance, and special physical properties. Tickets for each exhibition are available from the local area office of Henry Wiggin & Company, Limited, or direct from the head office at Wiggin Street, Birmingham, 16.

American Foundrymen's 62nd Castings Conference

Technical Material presented at Cleveland

(Continued from page 18)

This series of abstracts made from the wealth of technical papers presented during sessions of the American Foundrymen's Society at the 62nd Castings Conference, held recently at Cleveland, Ohio, continues with a further selection from the wide range of papers—almost 100 in fact—which were read before AFS delegates and members on that occasion.

Factors Influencing the Resistance of Steel Castings to High-stress Abrasion

By T. E. Norman, Metallurgical Engineer, Climax Molybdenum Company, Denver, Colorado.

The abrasion resistance of heavy section steel castings has been studied by service tests on ball-mill liners and by a short-time test procedure which correlates well with the results on actual liners. The short-time test made it possible to determine the effects of many more variables in composition, structure and heat-treatment than could ever be determined by many years of testing on actual liners. Grinding-mill liners constitute one of the more important applications for steel castings which are used under conditions of high-stress abrasion. Severe abrasion, accompanied by varying degrees of impact, occurs in these mills.

The abrasive forces in ball and rod mills are largely of the "high-stress" type. This high-stress wear occurs when mineral particles are crushed between two surfaces. Quartz and silicate minerals are the most common materials which produce the wear resulting from these abrasive forces. The test procedure which was used for liner materials is rather similar to a procedure developed and described for grinding balls. The principal difference is that for liner materials, large size balls (usually five-in. dia.) are used so that their cooling rates during solidification and heat-treatment are such that they will develop structures similar to those in the heavy sections of liners having the same composition and treatment.

After marking, all of the test groups are "worn-in" by charging them all at one time into an operating ball mill. The test-balls seldom constitute over one per cent. of the total weight of ball charge in the mill. They are run in this mill for a sufficient length of time to remove about $\frac{1}{8}$ in. of metal from their surface. As many as 30 different groups, each with a different identification, have been run at one time by this procedure.

At the end of the wear-in, all of the marked test balls are recovered at one time from the rest of the ball charge. The wear test consists of running the groups of marked and weighed balls, including a group representing a "standard" material, in an operating mill for a sufficient length of time to remove from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. of metal from their surfaces. The test balls are all charged into the mill at one time and removed at one time so that all are exposed to identical operating conditions. Following this they are re-weighed individually, the Rockwell "C" hardness on their worn surface is determined, and their surface area is calculated from their specific gravities and weights.

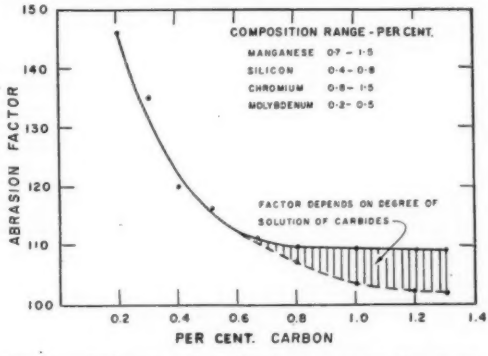


FIG. 1.—*Influence of carbon content on the wear rates of martensitic cast steels.*

In the course of wearing out over 500 sets of ball-mill liners in the primary grinding mills at Climax, Denver, Colorado, many different materials have been investigated. On the five most commonly used cast-steel types, the averaged performance data has been compiled. The relative wear rates for the five-in. balls, on two or more tests, normally do not vary more than 1 per cent. from the values given in Table 1.

Figure 1 shows the relative wear rates obtained from a series of low-alloy steels of varying carbon content. Each composition was suitably heat-treated to develop a "fully hardened" martensitic type of structure. It may be seen from Figure 1 that the abrasion resistance of martensite improves at a fairly rapid rate up to about 0.7 per cent. carbon.

High-carbon steels are suitable if the high austenitizing temperature succeeds in dissolving all of the carbides. Otherwise 0.60 per cent. carbon is the point of best performance. After quenching in liquids from temperatures above 930 deg. C., then tempering at 430 deg. C. produces best results. Tempering above 550 deg. C. leads to inferior performance. High hardenability is associated with alloying ingredients. These elements assist in austenite retention thus providing high hardenability. Carbon is important up to one per cent. and manganese, nickel, molybdenum and chromium 2 per cent. Manganese contents exceeding 2.5 per

cent. decrease the resistance to wear. Higher manganese contents retain austenite. Nickel is similar to manganese.

Pearlitic Steels

Pearlitic steels, such as No. 4 in Table 1, are used for discharge grates on ball mills. The wear resistance improves in these steels with carbon contents up to one per cent. After quenching these steels, a tempering treatment at 550 deg. C. produces a hardness of 38 to 40 Rockwell "C" with no loss in abrasion resistance. Tempering at higher temperatures up to 650 deg. C. introduces some loss in abrasion resistance. As ball-mill materials cast alloy steels compare favourably with the best white irons.

TABLE 1.—*Relative Wear Rates of Liner Steels when Tested both as Liners and as Large Grinding Balls at Climax.*

Item No.	Typical composition—per cent. C.	Mn.	Cr.	Mo.	Hardness* Rockwell "C."	Relative wear rates, five-in. balls.	Mill liners.
1	1.0	0.8	6.0	1.0	54—58	100†	100†
2	0.7	1.0	1.5	0.5	56—61	111	107—115
3	0.7	1.0	1.5	0.5	49—52	126	120—130
4	0.8	0.8	2.5	0.4	38—41	127	122—127
5	1.2	12.0	—	—	47—52	140	140—145

* Hardnesses below this cold-worked surface are normally lower than those given above. The structure and hardness of the liners corresponds closely to that of the balls.

† This is a nominally assigned factor. Relative wear rates of the other materials are based on this factor of 100 for item 1.

Austenitic Steels

Among the austenitic steels, such as the conventional 12 per cent. manganese-alloy, possibilities appear to improve them with underalloyed austenites. In general they have been displaced by the martensitic and pearlitic steels and martensitic white irons. An improved experimental steel is suggested as containing 1.5 per cent. carbon, 1.3 manganese, 3.0 chromium, 1.5 nickel and 0.50 per cent. molybdenum. This steel quenched from 1,093 deg. C. and tempered to a Rockwell "C" hardness of 51 would appear to possess a desirable abrasion factor.

The austenitic steels gave the greatest range in abrasion factors. This was dependent largely upon their composition. Possibilities appear to exist for "lean-alloy" high-carbon austenites capable of showing substantially better abrasion resistance than the convention 12 per cent. manganese austenitic steel.

In the discussion proceeding from the paper the opinion developed that austenite stabilization need not be rated as detrimental. It was, in fact, occasionally desirable to maintain some austenite residue. In the case of hardenabilities, the nickel effect was not as damaging as manganese in structures containing an excess of austenite.

A question of corrosion resistance as a factor in wet grinding was dismissed by the author as negligible but unsolved. Questions concerning whether molybdenum, chromium and nickel had contributed anything to austenitic-manganese steel led to the comment that the underalloyed austenites did not perform well in rock crushers. Somewhat similar opinion prevailed concerning the application of austenitic steels in the very large Taconite ore-grinding mills used at the iron-ore mines. Tests in these very large mills were proposed.

During discussion the reliability of the short-time wear test was questioned in view of the extensive effects of heat-treatment upon the metal surfaces. This criticism applied specificially to the five-in. diameter ball test.

TABLE 2.—*Comparison of some Martensitic Steels and Martensitic White Irons in Ball Mills at Climax, Colorado.*

Item No.	Description and Heat-treatment.	Composition—per cent. C.	Mn.	Si.	Cr.	Mo.	Ni.	Hardness* Rc1.	Rc2.	Abrasion factor.
1	Martensitic Cr-Mo white iron, air-cooled from 1,066 deg. C.	2.8	1.0	0.6	15.0	3.0	—	54	66	89
2	Martensitic high-Cr white iron air-cooled from 1,093 deg. C.	2.7	1.0	0.6	26.0	—	—	53	64	98
3	Martensitic Cr-Mo steel, air-quenched from 1,038 deg. C. tempered 204 deg. C.	1.0	0.8	0.6	6.0	1.0	—	49	55	100 (Std.)
4	Chill-cast Ni-Cr-Mo white iron, cast, cooled in sand, tempered 210 deg. C.	3.2	0.7	0.5	2.0	1.0	3.0	—	59	107
5	Sand-cast Ni-Cr white iron, sand-cast, cooled in moulds, tempered 218 deg. C.	3.2	0.6	0.5	2.0	—	4.0	53	60	109
6	Martensitic Cr-Mo steel, quenched in salt. Tempered 260 deg. C.	0.7	1.0	1.0	1.5	0.5	—	55	58	111
7	Chill-cast Ni-Cr white iron, cast, cooled in sand, tempered 218 deg. C.	3.0	0.5	0.4	2.1	—	4.5	—	55	116
8	Martensitic Cr-Mo steel, water-quenched and tempered 204 deg. C.	0.4	1.5	0.4	0.8	0.5	—	48	55	120

* Hardness Rc1 represents the average hardness about ½-in. below the original surface of the balls prior to the wear-in and wear test. Hardness Rc2 is the average Rc hardness on the worn surface of the balls after the wear test. It reflects the effect of cold-work hardening at this surface.

Effect of Vanadium on the High- and Low-temperature Mechanical Properties of a 1 Cr-1 Mo Cast Steel

By L. D. Tote and R. S. Zeno, General Electric Company, Schenectady, New York.

The purpose of the study reported was to determine the effect of vanadium content on the high- and low-temperature mechanical properties of a one per cent. chromium, one per cent. molybdenum cast steel. Steels were tested in the normalized and tempered condition at comparable hardness levels.

The report presents the following conclusions:—(1) A significant increase in rupture strength occurred at the higher parameter numbers (M =

* Parameter numbers refer to the Miller-Larson parameters (*Transactions* of the American Society of Mechanical Engineers, **74**, July, 1952, 765-771) which relate time and temperature to stress. Thus a high temperature and a short time loading may be chosen as one example or a lower temperature and longer time loading as another parameter. The parameter pinpoints the significant spot in this relationship.

36,000-39,500).* (2) Increasing the vanadium from 0.04 to 0.22 per cent. lowered the rupture ductility. (3) Tensile and yield strengths appeared unaffected as a result of increasing the vanadium content from 0.23 to 0.54 per cent. (4) Increasing the vanadium content from 0.04 to 0.22 per cent. increased the energy and fracture appearance transition temperatures approximately 95 F. and 66.2 F. respectively. (5) Bainite became finer with vanadium additions to 0.40 per cent. and became smaller with the 0.54 per cent. vanadium.

Cast Age-hardenable Austenitic Steel

By E. A. Lange, N. C. Howells, A. Bukowski, Naval Research Laboratory, Washington, D.C.

The paper reported upon research work directed to produce a high-strength low-magnetic permeability steel for special purposes. The yield strength of the steel was to exceed 44.6 tons per sq. in. and the magnetic permeability finished at less than 1.2. Marginal austenitic steels and precipitation hardening austenite steels were expected to deliver the required properties. In these steels some carbide former seemed to be needed such as vanadium or molybdenum along with austenite stabilizers such as nickel, manganese, chromium and nitrogen. Alloy compositions revolved around four basic types:—(1) 18 Cr + 8 Ni + 0.25 P; (2) 18 Cr + 12 Mn + 1.20 C; (3) 5 Cr + 10 Mn + 6 Ni; (4) 2 Cr + 14 Mn + 3 Ni.

The alloys above were to be modified when desirable with vanadium contents from 0.3 to 1.2 and molybdenum contents from 0.50 to 1.5. In general heat-treatments would be applied which involve solution treatments at about 1,100 deg. C. and ageing treatments for 8 hr. or more at approximately 650 deg. C. In the first series, phosphorus additions were applied and proved that phosphorus in excess of 0.25 per cent. would provoke difficulties. Carbon in excess of 0.25 per cent. acted similarly. The base composition in this case contained 17 per cent. chromium and 10 per cent. nickel. Mechanical properties were unsatisfactory. Additions of molybdenum were not helpful but a manganese addition of 3.5 per cent. produced a yield strength exceeding 53.5 tons per sq. in. with a tensile of 58.0 tons per sq. in. to 66.9 tons per sq. in. and 2 to 4 per cent. elongation. These results indicated promise for the phosphorus treatment but the mechanical properties were still undesirable from the ductility standpoint.

The second series with a 12 per cent. chromium, 10 per cent. manganese, 2 per cent. nickel, 0.25 per cent. carbon and a small amount of vanadium also delivered tensile values in the 49.1-62.5 tons per sq. in. range but proved too brittle for acceptance.

In series (3) some promising results were obtained with 6 per cent. chromium, 9 per cent. manganese, 9 per cent. nickel, 3 per cent. molybdenum, carbon up to 0.65 per cent. and vanadium up to 0.90 per cent. Desirable results were obtained when vanadium was omitted and carbon reduced to 0.25 per cent. with ensuing values of 49.1 tons per sq. in. tensile and 40.1 tons per sq. in. with 11 per cent. elongation.

Effective Preventive Maintenance Programme

By W. Huelsen, Caterpillar Tractor Company.

Mr. Huelsen concluded that over-all plant efficiency is best achieved through proper relationship between maintenance and engineering functions:—

1. The foundry manager has the responsibility to make sure that planning and production departments get the engineering and maintenance services they need.
2. The foundry engineer should provide maintenance services to each shift and also should give the maintenance department the technical assistance it needs.
3. The general maintenance supervisor has charge of all three shifts in the maintenance department. He should see to it that each shift supervisor provides for the needs of both the preceding and succeeding shifts, thus assuring continuity of operation.

Observations on Pinhole Defects in White-iron Castings

By R. W. Heine, University of Wisconsin.

Producers of malleable iron are occasionally plagued with pinhole defects on white-iron castings. Identifiable types of pinholes include the following:—Type 1—Reaction pinholes. Type 2—Aspiration pinholes or bubbles. Type 3—Evolution pinholes. Type 4—Miscellaneous (isolated pinholes). Each of these types will now be dealt with in turn.

Reaction pinholes develop at the casting surface by reaction of carbon in the iron with oxygen usually in the form of oxides. They occur in clusters or groupings at the casting skin. Cause of the reaction is the inherent chemical tendency of white iron to form an iron oxide-rich slag during cooling of the iron the ladle and in the gating during pouring. Below about 1,427 to 1,388 deg. C. the reactions are spontaneous and inevitable. When this slag is carried into the casting, pinholing can occur by the following chemical reaction:—

FeO (from the slag) + C (in the iron) = Fe + CO (the pinhole). The evolution of the CO nucleates the pinhole and permits it to grow.

Any variable which promotes the oxidation reaction will increase the incidence of pinholes. For instance, excessive free moisture in the sand, undermulled sand permitting a poor distribution of the water present, balling of sand, accumulation of iron oxide and iron silicate in the re-used sand, slag accumulations in feeders, slow pouring, high pouring temperature, hot-spots, gating that generates slag, and solidification caused by an insulating moulding sand all increase the likelihood of reaction pinholing. However, it is generally only when the slag has a chance to accumulate and wash into the casting under oxidizing conditions that pinholes result. A cloud of slag washed into the casting will deposit on either the mould or the core surface, and then the pinhole reaction begins.

In view of the mechanism of reaction pinholing, certain foundry variables are found of major importance in eliminating the defect:—

(1) Gating and pouring. The gating must be

designed to trap slag in feeders or runners outside the casting. Fast pouring to keep runners and feeders full may be helpful. By contrast, slow pouring may also be helpful if it serves to keep slag out of the casting by lessening turbulence.

(2) Scale and dirt must be allowed to accumulate in the sand. Dilution of used sand with new sand according to a planned replacement programme can keep the level of cleanliness high.

(3) Moisture level of bentonite-bonded moulding sand should be controlled at preferably less than 30 per cent. free moisture.

(4) The moulding sand should be thoroughly mulled to distribute the water present. Hot moulding sands require longer mulling times in this respect.

Aspiration pinholes are round in shape, and usually appear light coloured or mildly oxidized. They are ordinarily distributed at random, but bear some relationship to the ingate. Usually they occur singly or in groups of a few toward the interior of the casting. Aspiration pinholes normally result from poorly-designed gating, having a high-flow rate. Small area ingates, causing a jet effect in risers, aspirate gases into the metal stream.

Evolution pinholes are caused by gassy metal. They are usually rounded in shape, have unoxidized, light coloured or shiny surfaces, and occur in groupings or clusters in the interior as well as at the surface and subsurface portion of a casting section. The conditions leading to evolution pinholing are related to melting practices which have been very extensively reported. The presence of sufficient hydrogen or nitrogen in the iron to cause evolution pinholes results from other unusual malpractices in melting which are not within the scope of the paper.

Discussion developed that many shops would not encounter the pinhole problem in the small work where moulds are readily filled with hot metal. Large work and multiple castings in the mould would be the chief troublemakers. Discussion developed the point about Mr. Heine's paper that the influence of tramp elements in the metal could not be pinned down as a cause of pinholing. Some discussion as to the origin of iron oxide in ladle skulls and the use of considerable steel in the metal charges as sources creating a higher oxide potential took place.

Sand binders such as bentonite and clay, were mentioned as factors. Bentonite is harder to mull and distribute than clay or similar bonds. Good sand, free of pellets and well mulled, helped to avoid the sand problem.

Factors Affecting Toughness of Mild-steel Castings

By H. H. Fairfield and J. A. Ortiz, Los Angeles Steel Casting Company

Procedures for processing heats of steel to obtain suitable degree of boil, proper composition control, elimination of gas and slag condition were reviewed. The discussion indicated that high-carbon heats at 0.75 C. could require a carbon boil off of about 0.30 C. to eliminate gas (hydrogen). A lower carbon drop might invite an oxidizing risk with possibility of excessive inclusions. Recarburization was achieved by use of scrap graphite in the acid furnace or carbon briquettes in the basic furnace. Some additional discussion on the importance of controlling time of "boil out"; *viz.*, a slow boil removing a 0.30 C. content might produce an entirely different result from one which produced the same carbon decrease in less time.

Some criticism was made of judging slag on FeO content as an oversimplification. For example, a slag of 50 to 55 per cent. SiO_2 content leaves remaining the constituents, FeO, CaO, MnO, etc. Therefore, in comparisons the FeO content must be constant if the remaining oxides are so. This relates the slag viscosity to factors other than FeO content and emphasizes the need to define or keep constant the oxides which accompany FeO in the slag equilibrium.

The Electric Arc in Melting Furnaces

By W. E. Schwabe, National Carbon Company Division Union Carbide and Carbon Corporation

In this paper the principles of electric circuits, current control and operational factors involved in the melting of iron and steel in the three-phase electric arc furnace were reviewed and discussed. Questions indicated that the short arc produced best results and greater stability which was desirable in melting a cold charge. The desirability of keeping the furnace doors and other openings sealed—to reduce electrode wastage was emphasized. An estimate of electrode consumption increasing to 10 times normal was cited as having been established by permitting the access of air at 1,000 deg. C. at a velocity of seven to eight feet per sec. The pencilling or pointing of an electrode may be due to low heating temperature at the tip and more side wall damage to the electrode. Also, an oversize electrode could bring this about.

In the case under discussion, liquid metal had been charged into the furnace in a duplexing process; the energy added was small. Arc stabilization was desired and the pointed arc helped to achieve this. In cases of this type graphite electrodes of half the rated size might suffice to replace the existing carbon arc.

Ductile High-strength Titanium Castings by Induction Melting

By J. Zotos, P. J. Ahearn and H. M. Green

Melting and casting titanium and titanium-base alloys, it was pointed out, are difficult because of the metal's extreme reactivity with materials at elevated temperatures. Using a modified induction-melting technique, titanium-alloy scrap was remelted and processed into castings. Metallurgical evaluation of the castings included chemical analysis, scrutiny of macro- and micro-structure and mechanical properties.

These tests indicated that scrap titanium could be reprocessed by induction melting and still exhibit desirable engineering characteristics,

making it a useful foundry alloy with mechanical properties approaching specifications for forged titanium. The induction stirring of the melting furnace produced metal of uniform composition and temperature.

Gating and Feeding Shell Pattern Equipment

By D. C. Kidney, Westinghouse Air Brake Co.

Mr. Kidney pointed out some basic principles for improved shell-mould gating and feeding practice. He summarized these as follows:—(1) Work closely with the foundry in planning equipment. (2) Make a trial run in green sand. (3) Standardize as many items as possible—sprues, basins, runners and strainer gates. (4) To smooth the flow of metal, avoid crossing oven in-gates with the runner. (5) Place a basin at the bottom of the sprue to reduce turbulence and aspiration. (6) Extend runners past in-gates to form a by-pass to trap inclusions. (7) Round corners on gates and runners and substantial radii for additional mould strength. (8) Avoid excessive free drop of metal into gates and mould cavities. (9) Arrange the gating system to permit short-pouring times. (10) Do not crowd patterns and gates. Use material for gating compatible with the mounting plate.

Effects of Solution Treatment, Iron Content and Chilling of Sand Cast Aluminium/Copper Alloy

By E. M. Passmore, M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology

It is known that chilling, together with close control of other foundry variables, may be used to raise the mechanical properties of aluminium/alloy castings. This present work was undertaken to determine if greater control of the solution-treating operation or of impurity content might be effective in substantially improving the properties of sand-cast aluminium-copper alloys.

The example given was 195-Alloy of the following composition and properties:—(1) Nominal Composition—Copper 4.5, Iron 0.80, Silicon 1.0, Manganese 0.30, Magnesium 0.03, Zinc 0.10, Titanium 0.20, and (2) Nominal properties—16.07 tons per sq. in. tensile strength, 10.71 tons per sq. in. yield, 5.0 per cent. elongation. This, when chilled and refined by means of an adequate high temperature solution treatment, produced an improvement of the following order:—21.42 tons per sq. in. tensile strength; 16.96 tons per sq. in. yield strength; 12 per cent. elongation.

The investigation showed that chilling affects the structure of such castings by (1) refining the size and distribution of $CuAl_2$, (2) refining the size and distribution of impurity intermetallic compounds (3) reducing microporosity and (4) slightly reducing grain-size. Items 1 and 2 were shown to account for a substantial portion of the property improvement attributable to chilling aluminium-copper castings.

Iron contents of 0.24 per cent. or less did not have much effect on chill cast material. Much lower properties were obtained on unchilled castings because they produced a much coarser grain and much coarser precipitation particles.

For the production of high-strength high-ductility aluminium-copper castings, iron content should be as low as practicable and solution temperature as high as possible without resulting in casting warpage or partial melting.

Duplexed Automotive Cylinder-block Iron

A description of foundry practice in a large automobile foundry provided the technical aftermath to the luncheon of ironfoundry men at the Cleveland Congress when Mr. H. A. LaForet presented an informal description of activities at the Pontiac Motor Company, of Pontiac, Michigan.

Duplexing played a most important part in maintaining a close control of quality, necessary to operate on automobile machining line, processing 228 cylinder blocks per hr. with 20 machine-shop men attending to some 40-50 electric switches and controls. One casting with its structure out of bounds could stop the line and ruin expensive tools as well. Cylinder iron was made to low S and P composition of approximately:—Tc, 3.25; Si, 2.25; Mn, 0.75; Cr, 0.30.

TABLE 3.—*Typical Charges Before and After Duplexing*

	Before duplexing.	After duplexing.
	Per cent.	Per cent.
Steel scrap	14	9
Steel borings	10	13
C.I. scrap	32	30
C.I. borings	15	17
Malleable pig-iron	22	29
Briquetted alloys: Si, Cr, Mn	—	2
Alloy pig	4.3	None
Silvery (16 per cent. Si) pig	2.5	None
Coke per charge	850	550
Limestone	235	175
Output: 713-892 long tons daily.		

By duplexing the metal from a battery of 84-in. lined cupolas through a 13-17-ton electric furnace it was possible to reduce a composition spread of Tc, 3.40-3.60 and Si, 2.0 to 2.45 to Tc, 3.10-3.40 with Si, 2.15 to 2.35. In the process, the 13-ton furnace acted as a holding-heating ladle and processed 44.6 tons per hr. Temperatures were steadied at 1,540 deg. C. The chemistry, fluidity and chill were tested every 30 min. No additions were made to the electric furnace but ladles were treated with 1 to 2 lb. of inoculant per ladle. Prior to the electric furnace installation, additions of 15 to 20 lb. of Fe-Si were used to reduce the chill from a $\frac{6}{32}$ - $\frac{14}{32}$ range to $\frac{3}{32}$-$\frac{5}{32}$. Frequent cupola shut-downs in the past caused irregularities in melting conditions and high-chill effects as well as increased coke consumption. Now chill depths were down to $\frac{1}{32}$—and cylinder-block hardnesses at 179 to 212 (Brinell).

Overall economy resulted from the new equipment. An increase of 0.75 to 1.50 dollars* per short ton for equipment and maintenance was eliminated by a 4.00 to 4.50 dollar per ton saving in costs of charging stock, and alloys as well as operating and production costs.

With 713 to 892 tons of melt per 16-hr. day, these savings became considerable.

Melting briquetted borings brought in considerable economy. Tests had been made in which as much as 45 per cent. were used in the charges, but optimum performance settled the amount at 30 per cent where, prior to duplexing, 25 per cent. had been used. Typical charges are shown in Table 3.

(To be continued)

* For convenience the variable $2.80 = £1 can be used to obtain a monetary idea of the economies quoted.

British Blast Furnaces in the June Quarter, 1958

(These tables are published through the courtesy of the British Iron and Steel Federation.)

Derbyshire, Leicestershire, Notts, Northants, and Essex.

Name of firm.	In blast at end of the second quarter, 1958.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Clay Cross Co. (Iron & Foundries)	—	—	1	—	1	1	1
Ford Motor	—	—	1	—	1	1	1
Holwell Iron	—	—	3	—	3	3	4
Kettering Iron & Coal	—	—	1	—	1	1	2
Renishaw Iron	—	—	2	—	2	2	2
Sheepbridge	—	1	1	—	2	2	2
Stanton Ironworks: Stanton-by-Dale	—	1	3	—	4	4	5
Staveley Iron & Chemical	—	—	3	—	3	3	4
Stewarts and Lloyds: Corby	—	3	—	—	3	3	4
Wellingboro' Iron	—	1	—	—	1	1	3
TOTAL	—	6	15	—	21	21	28

Lancashire (excl. N.-W. Coast), Denbighshire, Flintshire, and Cheshire.

Brymbo Steel Works	—	1	—	—	1	0.9	1
Darwen & Mostyn Iron	—	—	—	1	1	1	2
Lancashire Steel Manufacturing	—	2	—	1	3	3	3
Summers, John	—	2	—	—	2	1·5	2
TOTAL	—	5	—	2	7	6·4	8

North-West Coast.

Barrows Ironworks	2	—	—	—	2	2	4
Charcoal Iron	—	—	—	—	—	0·8	1
Millom & Askam Hematite Iron	2	—	—	—	2	2	2
United Steel: Workington	2	—	—	1	3	3	3
TOTAL	6	—	—	1	7	7·8	10

Lincolnshire.

Appleby-Frodingham Steel	—	4	—	—	4	3.6	4
Lysaght's Scunthorpe Works	—	3	—	—	3	3	3
Thomas, R., & Baldwins: Redbourn	—	3	—	—	3	3	3
TOTAL	—	10	—	—	10	9,6	10

North-East Coast.

Consett Iron	—	2	—	—	2	2.4	3
Dorman Long (Steel): Acklam	—	2	—	—	2	2	4
Redcar	—	—	—	—	—	0.8	2
Bessemer	—	1	—	1	2	2	3
Clay Lane	—	2	—	—	2	2	2
Gjers, Mills	2	—	—	—	2	2	3
Normanby Iron Works	2	—	—	—	2	2	3
Skinningrove Iron	—	2	—	—	2	2	3
South Durham Steel & Iron:							
West Hartlepool	—	2	—	—	2	2	2
Cargo Fleet	—	2	—	—	2	2	3
TOTAL	4	13	—	1	18	19·2	28

Scotland.

Bairds & Scottish Steel: Gartsherrie	1	1	1	—	3	3	3
Carron	—	—	1	—	1	1	4
Colvilles: Clyde Works	—	2	—	—	2	2	3
Ravenscraig	—	1	—	—	1	1	1
Dixon's Ironworks	—	—	—	—	—	1.9	6
TOTAL	1	4	2	—	7	8 9	17

South Wales and Monmouthshire.

Briton Ferry Works	1	—	—	—	1	1	1
Guest Keen Iron & Steel: Cardiff	1	2	—	—	3	3	3
Thomas, R., & Baldwins: Ebbw Vale	—	3	—	—	3	3	3
Steel Company of Wales: Margam	—	4	—	—	4	3·9	4
TOTAL	2	9	—	—	11	10·9	11

Aluminium, Limited's Sales

Consolidated net income for the six months to June 30, 1958, of Aluminium, Limited, fell to the equivalent of 35 cents per common share from 88 cents in the first half of 1957. Mr. N. V. Davis, president, said that at the beginning of the second quarter of 1958 the company reduced the price of its primary aluminium in all markets by about 2 cents per pound.

Sales of aluminium in all forms were 150,000 tons in the second quarter of 1958, compared with 128,000 tons in the first three months. Despite the second-quarter improvement in sales, total production of the company's Canadian smelters this year has exceeded the tonnage sold.

On July 23 it was decided that Canadian production would be reduced from an annual rate of 620,000 tons to a rate of 560,000 tons. The new production rate will be approximately 72 per cent. of the installed capacity in the company's Canadian plants.

A quarterly dividend of 17½ cents (US), the same as for the previous quarter, has already been declared, payable September 5. The rate for the first quarter of 1958 was 22½ cents. Sales and operating revenues for the first half at $207,958,000 compared with $233,535,000. Net income, after preferred dividends of subsidiaries, was $10,451,000 ($26,548,000). Second-quarter earnings this year were $5,120,000 ($11,589,000).

Embargo List Cut

Last week, the Board of Trade announced a large reduction in the length of the list of goods upon which an embargo is placed if destined for delivery to the Soviet "bloc" and China. The earlier list consisting of 181 items has been cut down to 118, and this has been done in agreement with 15 or so other nations. The new list is infinitely more realistic, as before its publication, Russia and its satellite were in a position either to manufacture or in some cases export the banned goods. Whilst foundry plant has never been on the embargo list, the new one frees a large number of items which incorporate castings. Civil aircraft and machine tools in great variety have all been freed and if more business be forthcoming as a result, the foundry industry should benefit. Of the Soviet markets, China seems to be the most promising, as during the first six months of this year the UK exported to that country some £7,000,000 worth of goods, compared with £4,300,000 during the first half of 1937.

British Blast Furnaces in the June Quarter, 1958—*continued*

Staffordshire, Shropshire, Worcestershire, and Warwickshire.

Name of firm.	In blast at end of the second quarter, 1958.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Goldendale Iron	—	—	1	—	1	1	2
Lilleshall Iron & Steel	—	—	1	—	1	1	2
Shelton Iron & Steel	—	2	—	—	2	2	3
Stewarts and Lloyds: Bilston	—	1	—	—	1	1	2
TOTAL	—	3	2	—	5	5	9
Sheffield.							
Park Gate Iron & Steel	—	2	—	—	2	2	2
GRAND TOTAL	13	52	19	4	88	90.8	123

Weekly Average Number of Furnaces in Blast during the June Quarter, 1958, and the Previous Four Quarters

District.	1957.			1958.	
	June.	Sept.	Dec.	March.	June.
Derby, Leics., Notts., Northants and Essex	25.3	24.5	22.6	22.2	21
Lancs. (excl. N.-W. Coast), Denbigh, Flint, and Ches.	6.6	6	6.6	7	6.4
Lincolnshire	9.7	9.7	10	9.7	9.6
North-East Coast	21.1	20	20.5	21	19.2
Scotland	9	9.7	9.9	8.8	8.9
Staffs., Shrops., Worcs., and Warwicks.	7	7	6.2	5.4	5
South Wales and Monmouth	11	11	11	11	10.9
Sheffield	1.1	1	1.9	2	2
North-West Coast	8.4	8.8	8.8	8	7.8
TOTAL	99.2	97.7	97.5	95.1	90.8

The following companies have furnaces in course of construction or rebuilding:—Lancashire Steel Manufacturing Millom & Askam Hematite Iron; South Durham Steel & Iron (West Hartlepool); Steel Company of Wales; Guest Keen Iron & Steel.

Blackness Foundry Compensation Offer

A conditional compensation offer made to employees of Blackness Foundry, Dundee (the closing down of which was recently reported), has been rejected by the unions concerned. The works belong to Urquhart Lindsay & Robertson Orchar, Limited, a subsidiary of Fairbairn Lawson Combe Barbour, Limited, Leeds. The management's offer was that workers with over five years' service would receive 30s. for each year of service over five. All would receive four weeks' notice, and approximately three-fifths of the workmen would be given notice this month.

Compensation payments and the four weeks' notice were conditional on the men agreeing to shift machinery, *i.e.*, any machines the firm desire to transfer to their Leeds establishment. The men must agree to load these machines before compensation or a four-weeks' period of notice would be given. The offer was unanimously rejected by the men as they were of the opinion that if the machinery was shifted out of the factory it would be detrimental to any firm taking over the establishment as a going concern. The management of the works has declined to comment on the employees' decision.

Parsons Marine and Brown, Boveri to Collaborate

A member of the Richardsons Westgarth group, Parsons Marine Turbine Company, Limited, has entered into an agreement with Brown, Boveri & Company, Limited, of Baden, Switzerland, for technical collaboration on the design and manufacture of marine steam turbines.

Parsons Marine Turbine's long experience in the design and manufacture of marine steam turbines and associated reduction gearing, coupled with Brown, Boveri's wide experience of steam turbines for land use, and its large research facilities, will constitute a unique arrangement for the development of highly efficient and reliable power units.

A third company to be associated with this collaboration—the Compagnie Electro-Mecanique, Paris—has been collaborating for more than 50 years with Parsons in the marine field, and with Brown, Boveri in the land field, as well as with Brown, Boveri, Mannheim.

Parsons Marine Turbine's future policy will be to offer marine steam turbines of either Pametrada design, or those produced as a result of this collaboration.

CHARLES WINN & COMPANY, LIMITED—Mr. H. H. Gwillam, who recently attained the age of 65, has retired from the board. Mr. A. C. Horabin, previously outside sales manager, has been appointed a director of the company.

Equipment & Supplies

Electrical Heat-treatment Furnace

The electric vertical forced-air circulating furnace (Fig. 1), produced by Hedin Limited, Commerce Estate, South Woodford, London, E.18, has now undergone internal modifications to raise its efficiency and simplify its construction. The centrifugal-type fan used is of sufficient size to force large quantities of air under high pressure through the densest charge, the work container being so situated that all the airflow is directed through the charge. The speed and volume of the airflow result in only a very small drop in temperature from top to bottom in coming up to temperature, and practically no difference when on control. Overheating the outside of the charge by direct radiation is impossible since the elements are placed outside the airstream.

A well-insulated cover-lifting mechanism is simple and compact and enables the largest cover to be lifted and swung to either side with minimum effort. These furnaces have a very wide field of application, both for dense and loose loads. Aluminium can be solution- or precipitation-treated, though for the former operation a quench tank would also be required.

Rapid Drying of Castings

A new technique for the rapid drying of metal articles has been introduced by Imperial Chemical Industries, Limited, Millbank, London. Metal parts are treated in trichloroethylene to which has been added a special new additive, "Trisec," which ensures the avoidance of staining even of bright plated and polished parts. It is well known that wet metal articles can readily be dried by immersing them in the vapour of a boiling chlorinated solvent, such as trichloroethylene—the solvent used in most ICI degreasing plants. The moisture film will dry off because, although the boiling point of trichloroethylene (87 deg. C.) is below that of water, a mixture of solvent and water boils at an even lower temperature (73 deg. C.). Vapour degreasing plants can therefore be used for drying small metal articles, even though the evaporation of large drops of water from the surface leaves stains. Owing to the risk of staining, such a method is not suitable for bright plated or other polished surfaces. With the new ICI technique, the idea of using trichloroethylene has been retained, but the treatment is in liquor instead of vapour, and to prevent stains forming on the articles, the special additive, "Trisec," is mixed with the solvent. This additive has been specially developed to be effective at moderate temperatures so that advantage can be taken of the low heating requirements of the solvent. The effect of the additive is to displace the water film on the metal surface by the trichloroethylene, which readily evaporates.

The treatment is most effectively carried out in simple equipment similar to a standard LV2 or LV3 ICI degreasing plant, but incorporating a water separator, extra free-board above vapour level, and fitted for rim ventilation. One compartment—the one containing "Trisec"—is used for the drying operation and the other for the subsequent rinsing of the dried parts in pure boiling trichloroethylene. This ensures that the articles are not only perfectly dry, but also quite free from grease contamination. The whole process is normally completed in about one minute.

FIG. 1.—*Electric vertical forced-air heat-treatment furnace for small castings, particularly in light alloys* (*Hedin Limited*).

GRESHAM TRANSFORMERS, LIMITED, of Hanworth, Middlesex, have announced that, after a year of field tests with production prototypes of their earth-lead tester in order to determine the most efficiently designed, easily operated and economically produced unit, the final model is now in production. The tester, for 240 volts, 50 cycles, single-phase supply, is also the result of close collaboration between HM Factory Inspectorate and the company. The instrument makes its rapid test by ascertaining the continuity and adequacy of the earth lead of a tool or appliance, the supply lead of which is plugged into one of the standard three-pin sockets (5-amp., 13-amp., and 15-amp.) on the panel.

A. A. JONES & SHIPMAN, LIMITED, Narborough Road South, Leicester, announce the introduction of a new range of precision dividing tables. Apart from their normal function in conjunction with machine tools, these are useful to patternmakers and in foundry inspection departments for marking-off purposes. Literature is available to readers on writing to the firm.

INDUSTRIAL FOUNDRY MATERIALS, LIMITED, Midland Bank Chambers, Lye, near Stourbridge, have used an illustrated two-page leaflet to describe the "Steloy" L.14 Shell MK 111 coreblower. This is a pneumatic machine worked off a 80 to 100 lb. per sq. in. compressor line. The time cycles are preset in such a way that the piecework cannot "beat" the timing cycle.

DEB CHEMICAL PROPRIETARIES, LIMITED, Belper, Derbyshire, have now marketed their "Gwish Aerosol" fire extinguisher. The unit contains 12 fluid ounces of extinguishing liquid, released as a powerful jet spray by depressing the discharge nozzle, release of the nozzle completely cuts off the jet.

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News in Brief

INGOT FOUNDRY COMPANY, LIMITED, has plans in hand for the erection of extensions to the works premises in Sherwood Road, Brighouse, Yorks.

MAITLAND (IRONFOUNDERS), LIMITED, has been granted planning permission for the erection of extensions to the works in Gartlea Road, Airdrie, Lanarkshire.

A HEENAN CW.10 CHAIN WELDING MACHINE has recently been despatched by Wickman, Limited, of Coventry, to the Daihan Anchor Chain Manufacturing Company, of Korea.

NEXT YEAR, the Amalgamated Union of Foundry Workers will celebrate the 150th year of its establishment, and a book is being prepared covering its activities during this period.

B. O. MORRIS, LIMITED, of Coventry, have extended their range by becoming sole agents for the United Kingdom, and the sterling area, for the Grasso range of pneumatic tools which are manufactured by this well-known Dutch company.

SMITH & MCGOWAN, LIMITED, has been formed with a capital of £5,000, to acquire and carry on the business of Smith & McGowan, brassfounders and coppersmiths, Commercial Street, Leith. The directors are Mr. James Smith and Mr. Alexander McGowan.

SIEBE GORMAN & COMPANY, LIMITED, Neptune Works, Davis Road, Chessington, in view of the claim made by the agents of a German firm, state that their Mark VIII dust respirator has been approved by Her Majesty's Chief Inspector of Factories.

THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION has called an extraordinary general meeting for 2.15 p.m. on September 2, at the Waldorf Hotel, London, the purpose being to reconsider articles of association relating to membership of the Council.

RECENT SHIPBUILDING ORDERS include one for Henry Robb, Limited, Leith, who are to build a dredger for the Blyth Harbour Commissioners, and another is for Lithgows, Limited, Port Glasgow, who are to build a cargo vessel of 5,280 tons deadweight for Jamaica Banana Producers Steamship Company.

FOXBORO-YOXALL, LIMITED, announce the appointment of Mr. W. E. Preston to their staff of technical representatives. Mr. Preston will cover Northumberland, Durham, Cumberland, Westmorland and the Middlesbrough area of Yorkshire. His address is 49, Ivanhoe, Whitley Bay, Northumberland.

J. M. RODGER & SON, LIMITED, ironfounders, Ayr, have installed shower-baths, locker and drying rooms for their employees as part of a new amenity block in a converted store. The firm have also resumed their five-day week which for some time had been curtailed. The firm, the oldest of its kind in Ayr, was founded in 1867.

THE INDUSTRIAL WELFARE SOCIETY announces a one-week training course for foremen and forewomen under the title "Developing Foremanship Skills in Handling People," which will be held at the Society's headquarters, Robert Hyde House, 48, Bryanston Square, London, W.1, from Monday, September 15, to Friday, September 19.

TWO TONS OF METAL exploded last week while being poured into a vat at the Westgate Ironworks of W. A. Baker, Limited, Corngethin Wharf, Town Dock, Newport, injuring seven men, one seriously. Several men working nearby were also splashed by the white-hot metal, which started 20 small fires over a 40-ft. radius of the casting bay.

HALL, RUSSELL & COMPANY, LIMITED, Aberdeen, have received an order for two motor ships, each of 1,350 tons dw., for John Kelly, Limited, Belfast. Both ships are to be built at the adjacent yard of Alex. Hall & Company, Limited, an associate company. Diesel engines for the new coasters are being supplied by British Polar Engines, Limited, Glasgow.

A MAGNESIUM FOUNDRY at Apc, northern Hungary, which goes into operation next month, is expected to produce 100 tons of magnesium next year and 300 tons a year by 1961. Hungary at present imports 300 tons of magnesium a year. The new foundry will aid the manufacture of aluminium-alloys and enable Hungary to expand processed-aluminium exports.

THE GUEST KEEN & NETTLEFOLDS GROUP OF COMPANIES has set up a central advisory service which will be known as the G.K.N. Group Export Services Organization (G.E.S.O.) and it will operate from Shell Mex House, Strand, W.C.2. The organization will be under the general direction of Mr. H. W. A. Waring, C.M.G., managing director of Brymbo Steel Works, Limited, and a former international civil servant with wide experience in overseas markets.

RECEIPT OF NEW ORDERS by the parent company, John Fowler & Company (Leeds), Limited, is not the primary reason for the Sprotborough works, Doncaster, returning to full time. New orders for castings obtained from customers in many parts of the country have greatly improved the order-book, the general manager of the Sprotborough works informs us. In a recent note we announced the restoration of a five-day week after some six weeks of four-day working.

THE OWEN ORGANIZATION announce that they have acquired the business of Mechanair formerly carried on by Acocks Engineering Company, Limited. Mechanair are manufacturers of air compressors and installations, pressure vessels, etc., and the manufacture of these will, in future, be carried out at Darlaston. Mr. J. E. Kavanagh, the former managing director of Acocks Engineering Company, Limited, will be in charge of the Mechanair division of Rubery Owen & Company, Limited.

THE PRODUCTION OF STEEL at the Rhodesian Iron and Steel Company's works, near Que Que, Southern Rhodesia, is increasing steadily, Mr. W. C. Fletcher, general manager of Risco, reported recently. In 1957, he said, production reached 67,000 ingot tons, in 1958 it was hoped to reach 80,000 tons and possibly 100,000 tons in 1959. When the current expansion programme was completed it was hoped to reach 150,000 tons in the first stage. The final aim was 250,000 tons.

A CONFERENCE will be held by the Combustion Engineering Association on November 11 and 12 at the Royal Hotel, Scarborough. The first day of the conference will be devoted to an examination of the fourth annual report of the National Industrial Fuel Efficiency Service and to analyse the findings of NIFES in their work with industry; to stress the inefficiency which has been found in the use of fuel and, at the same time to show where the greatest savings can be made and how they can be most easily accomplished.

THE WHOLE of the ordinary share capital of Air Control Installations, Limited, has been acquired by Beyer Peacock & Company, Limited, of Gorton, Manchester. Mr. F. D. Moul, B.SC., A.C.G.I., A.M.I.MECH.E., will shortly be retiring from his position as chairman and managing director, but will continue to be associated with the company in an advisory capacity, as

Cast-Weld Problems of the Antarctic Expedition

Four hundred employees at the Bilston (Staffs) factory of Quasi-Arc, Limited, learned recently how the firm's welding equipment was used on the Trans-Antarctic Expedition. Mr. David Pratt, chief engineer on the Expedition, and his assistant, Mr. Roy Homard, visited the firm recently, when two lectures, illustrated by film and slides, were given to office and works personnel. On the Expedition, Mr. Pratt and Mr. Homard were responsible for the installation of electrical-power supply at Shackleton base, together with the care of materials in temperatures as low as -60 deg. F. and the maintenance and overhaul of vehicles.

The tracks of the Sno-Cat vehicles which were used were built up from two alloy-steel castings joined together by a steel tube, the ends of which were welded to each track casting. This assembly formed one track member and a number of members were joined in parallel by flexible link connections to form a complete track. On preliminary tests in Norway, one of the track tube-members broke away from the track casting and a number of welds on the tracks on the same vehicle were also found to be cracked. Metallurgists from Quasi-Arc had examined the tracks from the other two vehicles and found that a number of other welds had also cracked. After the radiographic examination had revealed additional faults, it was agreed that re-welding should be carried out, using the firm's low-hydrogen electrodes and four types of their electrodes were taken on the Expedition for the carrying out of emergency repairs— one for repairs to the main aluminium bodies of the vehicles and another for the repair of cast-iron components (this giving machinable welds without pre-heating); a third was used for the repair of steel components because it gave a deposit with high crack-resistance under difficult conditions and without pre-heating, and the low-hydrogen electrodes were also taken in view of their suitability for welding steel designed for service at sub-zero temperatures. Among the tasks performed during the Expedition was the welding of a Sno-Cat nose-attachment to enable it to be linked to a vehicle so that a dangerous crevasse could be negotiated.

Technical Aid for Industry

THE ROYAL COLLEGE OF SCIENCE AND TECHNOLOGY, Glasgow, have inaugurated a technical liaison service which is designed to help small and medium-sized firms in the solving of their problems, whether these are technical, managerial or financial. A pilot scheme sponsored by the Scottish Council (Development and Industry) has indicated through its results the lines on which the service can be effective. (This was dealt with editorially in the July 17 issue of the JOURNAL p. 65).

The Scottish Education Department have authorized expenditure on the proposed service which is placed under the care of Professor Chris McCrae, head of the Department of Industrial Administration of the College. It will be carried out from the Department's residential college at Bearsden. An officer has been appointed for the work, and approaches are being made to firms in the selected categories which will correspond, broadly, to the categories already investigated in the pilot scheme—firms of under 500 employees. The project is regarded as experimental, and progress and achievement will be reviewed at the end of three years.

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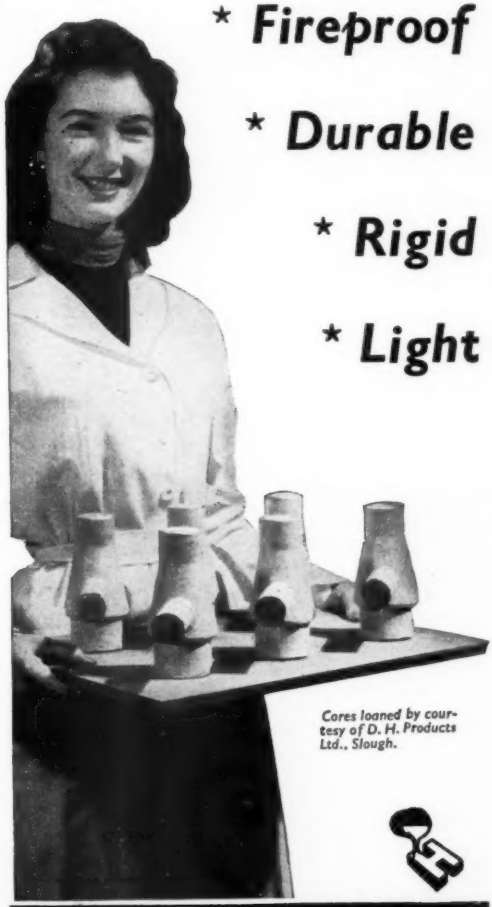

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News in Brief

director and president of the company. The general policy of the company will remain unchanged, and it will continue to manufacture its air-treatment equipment as heretofore.

AT HALIFAX, extensive development is taking place at two production centres of the Asquith Machine Tool Corporation. Work began last week on clearing the site at the works of William Asquith, Limited, machine tool makers, High Road Well, for the construction of two heavy engineering bays, each 360-ft. long and 80-ft. wide, a project which is expected to be completed in a year. Nearby a big steel and asbestos-built bay is nearing completion, which will become Modern Foundries, Limited's, new fettling (metal dressing) department, incorporating a Hydroblast section.

AT the Milan machine-tool exhibition to be held in Milan Fair exhibition buildings from September 11 to 21, two large stands (Hall 3 No. 3402; Hall 4 No. 4217) are being taken by Triulzi, s.a.s. (London office, 2, 3 and 5 Studio Place, Kinnerton Street, S.W.1.) totalling 1,730 sq. ft. to show die-casting machines and various types of presses. These will include hot- and cold-chamber die-casting machines (both water hydraulic and oil operated) Some models will be working during the exhibition. The Triulzi concern has also decided to participate in the International Technical Exhibition taking place in Turin from September 27 to October 7, on stand Nos. 801-802 and 811-812.

NEW and higher standards of passenger comfort in railway travel are envisaged from British Railways' decision to install long-welded rails on main lines throughout the country as track renewals become due. Long-welded rails, which are made by welding rails together to form continuous lengths of a quarter-of-a-mile or more, greatly reduce noise and will give passengers smoother riding. The rails are built up in the depots from 60-ft. lengths of British Railways' standard flat-bottom rail, joined by the Flash-Butt welding method into lengths of 300 ft.—a convenient length for transporting to the site where they are to be laid. When the 300-ft. lengths have been positioned in the track, the ends are welded together to form continuous lengths of a quarter-of-a-mile or more. An important contribution to further economies may be made by long-welded rails, as there are no rail joints (which account for some 25 per cent of normal permanent-way maintenance) and rail-end failures are eliminated.

SBAC Exhibition

The exhibition of the Society of British Aircraft Constructors will be held as usual this year in conjunction with the Farnborough Air Show between September 1 and 7. Among stands and exhibits likely to interest foundrymen the following may be mentioned.

Of the Manchester Oil Refinery group of companies, MANCHESTER OIL REFINERY (SALES), LIMITED, will be demonstrating fluids for the non-destructive detection of flaws in aircraft components, including the Britemor fluorescent process which is now A.I.D. approved, and FLEXIBOX, LIMITED, will be exhibiting a full range of mechanical seals for rotary-shaft airborne mechanisms (*Stand No. 196*).

The Minispace, a small analogue computer, will be shown for the first time on the stand of the SOLARTRON ELECTRONIC GROUP, LIMITED (A.30, caravan enclosure). The Minispace, which is completely self-contained, comprises 10 drift-corrected D.C. amplifiers with all the necessary input and feedback components, potentiometers, control and patching panels, power supplies, etc., and is contained in a cabinet 51-in. high, 20-in. wide and 30-in. deep.

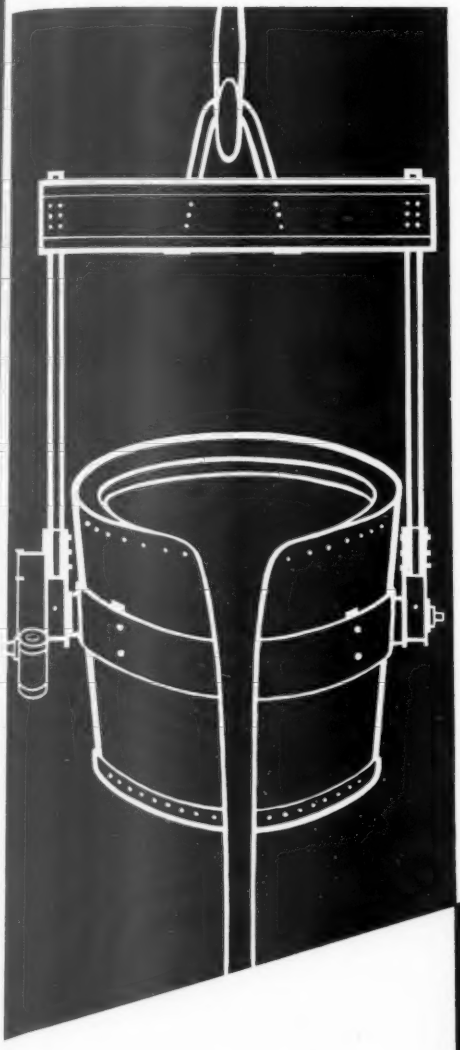
Three subsidiary companies of ENGLISH STEEL CORPORATION, LIMITED, will combine their displays on *Stand No.* 114. English Steel Forge and Engineering Corporation, Limited, will show a selection of drop-forged components for airframes, engines, propellers, undercarriages and rockets; English Steel Rolling Mills Corporation, Limited, will feature special aircraft and tool steels, and a comprehensive range of engineers' cutting tools used in aircraft production will be exhibited by English Steel Tool Corporation, Limited.

SIMMONDS AEROCESSORIES, LIMITED *(Stand No. 195)*, will have two displays at the Farnborough Air Show, and products of Firth Cleveland Instruments, Limited, will be included. The theme of one of these will be "Handling Aviation Fuels." The exhibits will include:—Firth Cleveland flow meters; "Pacitor" and "Pacitran" fuel gauges; "Nyloc" self-locking nuts; spire speed nuts. Reference will also be made in the background display to the "Gilbarco" electronic tank contents gauge, liquid-level controllers and Simmonds flow-control valves.

ALBRIGHT & WILSON (MFG.), LIMITED, of London *(at Stand No. 199)* will be exhibiting components displaying the advantages of "Kanigen"—the new chemical nickel-phosphorus plating process now being operated in the UK by the company at Oldbury, Birmingham. Other items on show will include some guided-missile components, including a fly-off body used in the "Thunderbird" ground-to-air guided weapon. Several types of aircraft valves will be on show—including aluminium and "ni-resist" valves used in hot-air systems for cabin heating, de-icing, etc., in many different types of aircraft.

NORTHERN ALUMINIUM COMPANY, LIMITED, Banbury, Oxfordshire, will exhibit (*Stand No. 134*) part of an aircraft structural member, 9 by 2 ft. 6 in. by 1¼ in., machined from a piece of aluminium plate. Exemplifying the use of integral construction which is being increasingly adopted in aircraft design, it also aimed at illustrating the facilities which Northern Aluminium Company now offers in producing large stress-free plate for this purpose. The other main exhibit is a hand forging in Noral B75S (DTD 683A), 5-ft. long and weighing three-quarters of a ton, several of which have been produced for a new aircraft of one of the leading manufacturers.

SAMUEL FOX & COMPANY, LIMITED and STEEL, PEECH & TOZER, of Sheffield *(Stand Nos. 96-97)* will display a colour diorama of an electric-arc furnace tapping molten steel into a ladle which will form the centre-piece of their joint exhibit. Against this setting of the steelmaking process, Samuel Fox will feature a range of 18 special steels which are regularly supplied to the aircraft industry. As well as specification details, there will be electron micrographs of a number of these steels obtained by electron microscope, showing their structure magnified × 30,000. Other exhibits will include stainless-steel link fencing which, because of its freedom from corrosion, is particularly suitable for airfield surrounds and other applications where a long, maintenance-free life is required. There will be a diagrammatic representation of an airfield control-tower clad with stainless-steel curtain walling, together with actual examples of curtain wall panels.



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Raw Material Markets

Iron and Steel

Although holiday influences will continue to affect the ironfoundries for the next week or two, a large number of establishments are already back at work. In many instances major repairs to plant and cupolas have been carried out during the stoppage, and it is hoped that for some months ahead there will be uninterrupted production coupled with increased business, although at the moment there are no signs of any improvement in the demand for castings. Business generally is only very moderate. Many consumers of castings are closed for holidays, while there has been no change in the trading conditions which will continue to keep many foundries working below capacity. On account of the suspension in receipt of raw materials at the foundries during the holidays, deliveries of pig-iron have been small and, with trade so quiet, a number of blast furnaces, contrary to normal practice, also closed down for the holiday period. Outputs of pig-iron from the furnaces in blast were mainly placed into stock, and the foundries will have no difficulty in obtaining promptly the supplies they require.

In all grades of pig-iron output continues to exceed demand, and, with home needs being so small, increased export business would be welcome, but competition abroad is very keen and home prices are much in excess of those quoted by overseas producers.

Only in the low-phosphorus irons does demand remain at a reasonable level, and the motor-car industry continues to take up the largest tonnage of castings using this iron. With the demands from many other trades for high-duty castings, the engineering and speciality foundries continue to be well employed; in addition to the low-phosphorus irons, they are taking up a good quantity of hematite and some refined iron. The light, jobbing, and textile foundries show no signs of obtaining an improvement in their production of castings and the prospects of increased demands being made upon them are not very bright.

Plenty of scrap in all grades is available for the foundries, while most grades of foundry coke are easily obtained. No difficulty is experienced in obtaining ganister, limestone, and firebricks.

Plentiful supplies of steel semis are available from home steelworks, but the re-rollers have insufficient work on hand to enable them to take up increased tonnages. Demands for all their products continue to be scarce, and production is much below capacity. Many of them have now taken their annual holidays, but there is no improvement in trade to enable them to increase the number of working shifts, and most of them are operating on a shortened working week. More export business would be very helpful to them, but orders are difficult to obtain against the lower prices quoted by mills abroad.

Non-ferrous Metals

As expected, the wide range of goods freed for export to the Soviet block included the raising of the embargo on the export of copper and aluminium in all forms to Communist countries. The market had, in some measure, already discounted this event, but the announcement of a further cut in the Bank rate to 4½ per cent.—the first time the Bank rate has been lowered in the month of August for 33 years—was enough to push the quotation higher. Indeed, the copper price in London might well have risen steeply were it not for the fact that the odds are growing shorter on hopes that the House of Representatives approve the stockpiling programme before the end of the present session. Against a wider background it is difficult to assess with any degree of accuracy the effect which the present unsettled labour position on the Northern Rhodesian Copperbelt is having on the market. If a solution to the current dispute is not found this could at least provide a strong resistance point below which the quotation would not fall.

In the United States the principle news item is the cut in the primary producers' price by ½ cent to 26½ cents a pound—the same as that quoted by the customs' smelters. The outlook for copper in the immediate future depends largely on the progress of the Mineral Stabilization Bill and the purchase of copper by the Communist countries.

Tin is a weak market both here and in the United States, bedevilled as it continues to be by Russian offerings of the metal. In London the price is at its support point of £730 a ton and is having to be supported by the buffer stock manager. The opinion seems fairly general that Russia will be accepted as an observer to the International Tin Council periodic deliberations despite opposition from the UK. The US price is now less than 94 cents a pound.

Lead continues quiet in London and in New York. In London the price is at its lowest this year and there seems little in the future outlook to reverse the present easy trend. In fact, the US position is not good and stocks are continuing to mount, with current production still in excess of current consumption. These are the particular set of reasons behind the cut in the price by the customs smelters of ¼ cent to 10¾ cents.

Zinc is in virtually the same position as lead. Both these metals are suffering from fears that the Minerals Subsidy Bill will not be approved before the current session ends. In the United States the market has also to contend with growing stocks and an imbalance as between production and consumption, although the basic price continues to be held 10 cents a pound. In London the quotation continues to drift downwards and it would probably be at a lower level were it not for the fillip received through the cut in the Bank rate and the continued steadiness of copper.

Notes from the Branches

Australia (Victoria)

The June meeting of the Australia (Victoria) branch of the Institute of British Foundrymen was given over to hearing a lecture on "Impressions Abroad," by Mr. A. W. Silvester and Mr. G. D'A Nash. Mr. Silvester had recently visited the USA whilst Mr. Nash had been to England. They spoke about the impressions they had received of the foundry industry when visiting these two countries.

The July meeting was given over to hearing a lecture on the "Applications for Nodular Cast Iron," by Mr. A. M. Main, chief metallurgist of Thomas Main & Sons. As usual the discussion was followed by a light supper.

South Africa

Mr. R. C. Cross, director and general manager of Foundry Services (SA) (Pty), Limited, has been elected president of the South African branch of the Institute of British Foundrymen. Mr. Cross is an associate of the Royal Technical College, Glasgow. Before he left this country he was chief metallurgist with David Brown Jackson, Limited, of Salford. He has been in South Africa since September, 1952. The vice-presidents are Mr. K. H. Coombs and Mr. D. Gordon Jones.

Mr. Walter Jones is vice-chairman of the joint advisory committee at John Summers. When his health made it desirable for him to retire from the sheet finishing department (above), he was found lighter work. "We couldn't have better people to work for," says Mr. Jones.

10,000 men work at John Summers. So many come to work by car and motor-cycle that they have special labels to help the works traffic control. Over 3,000 labels have been issued.

In this works one man in three drives to the job

Trevor Evans, Daily Express Industrial Correspondent, went to Wales and found an inspiration—and a challenge.

I WISH every industrialist in Britain had come with me to the steelworks by the Dee. What I saw was an inspiration. And a challenge.

There is no reason to suppose that this place, about five miles outside the boundaries of historic Chester, is out of step with the rest of the industry.

Mr. Richard Summers, the chairman of the company, was driving me through his works when I commented how odd it was to see a car park around the corner of almost every building. Finding more space for motor-cars was going to be a problem, he said. Whose cars?

10,000 Acres

HE looked at me in some surprise. Why, he said, the people who work here. Then he explained that so big is this site – it stretches over 10,000 acres, though so far buildings, offices, mills, furnaces and coke ovens occupy only about one-quarter of the Summers' land – that every vehicle bears a special label to speed its coming and going through the patrolled gates.

There are 10,000 working here. Nearly one-third come to work in motor-cars or motor-cycles. I thought Mr. Summers was talking loosely, in general terms. He wasn't. Nearly 3,200 labels have been issued. New applications are coming in daily.

First hands at the furnaces frequently take home more than £30 a week. The odd one has been known to take home £40 at a peak period, and the average for all is £15 a week.

Expansion

MR. SUMMERS explained to me how the present production of 1,000,000 tons of steel, mainly in sheets for motor-cars, drums and such household goods as refrigerators and washing machines, would be up to nearly 2,000,000 tons a year in about three years' time. "We go ahead, whatever happens," he said.

I saw ample evidence of expansion for the future, even to reclaiming land from the tidal water by battering down the refuse from the plant, thus adding a bit more to Wales.

Peace

ONE of the most impressive men I met at Shotton was Mr. Walter Jones, leading member of the steelmen's union, and vice-chairman of the works joint advisory committee. A thoughtful, deliberate kind of man with more than 40 years' service at the plant. "We couldn't have better people to work for," he says.

Management and workers have known each other long enough. This is largely a family affair.

It was old John Summers who inspired all this. He used to make clog irons in Stalybridge, Cheshire, more than 100 years ago.

He decided to make his own nails, so he made rough steel sheets. His son, Henry Hall Summers, bought this bleak land on the banks of the Dee in the nineties of last century. And Henry's son, Richard, is now the head of the concern.

There are all sorts of joint organisations on all aspects, from production to safety and sports.

This plant, like most others in steel, has a remarkable record of internal peace. There was dispute in 1911 – between two unions. But of official strikes against the management, none at all.

What can be wrong with an industry which commands the energy and loyalty of a lifetime's service from men of pride and skill?

ISSUED BY THE BRITISH IRON AND STEEL FEDERATION

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

August 20, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 0s. 0d. to £47 10s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £66 0s. 0d. to £66 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 6s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 9s. 6d. per b. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £83 10s. 0d. to £87 0s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £79 10s. 0d. to £85 0s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 0d. per lb. Cr; 1 per cent. C,* 2s. 0½d. per lb. Cr; 0.15 per cent. C,* 2s. 1½d. per lb. Cr; 0.10 per cent. C,* 2s. 1¾d. per lb. Cr; 0.06 per cent. C,* 2s. 2d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £78 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £206 15s. 0d. to £207 0s. 0d.; three months, £207 0s. 0d. to £207 5s. 0d.; settlement, £207 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 0½d. per lb.; rods, 236s. 9d. per cwt. basis; 20 s.w.g., 269s. 9d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £730 0s. 0d. to £730 10s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—Second half August, £69 0s. 0d. to £69 5s. 0d.; second half November, £70 12s. 6d. to £70 15s. 0d.

Zinc.—Second half August, £62 10s 0d. to £62 15s. 0d.; second half November, £63 5s. 0d. to £63 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £97 10s. 0d.; rolled zinc (boiler plates), all English destinations, £95 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £87 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 7¾d. per lb.; sheets to 10 w.g., 175s. 9d. per cwt.; wire, 2s. 5¼d.; rolled metal, 175s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £140; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £173; HTB2 (38 tons), £191; HTB 3 (48 tons),—.

Gunmetal.—BS1400, LG2 (85/5/5/5), £170; LG3 (86/7/5/2), £181; G1 (88/10/2/½), £242; (88/10/2/1), £233.

Phosphor Bronze.—BS1400, PB1 (AID released), £255 per ton.

Phosphor Bronze Strip, etc.—Strip, 259s. 6d. per cwt.; wire, 3s. 8⅞d. per lb.; rods, 3s. 0¾d.; tubes, 3s. 0¾d.; chill cast bars: solids 3s. 0¼d.; cored 3s. 1¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 7d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £79 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £213; AB2, £215.

Export Credits Guarantee Department

The Government have for some time been considering whether changes should be made in the organization and status of the Export Credits Guarantee Department, and on this subject they have had the advice of a committee under the chairmanship of Sir Eric Speed, the other members of which were Sir Matthew Drysdale, Sir Thomas Barnes and Mr. Bertram Nelson. The Committee reported some time ago, but inasmuch as the report for the most part deals with detailed matters of organization, the Government do not propose to publish it. Its recommendations, however, can be summarized as follow.

The main question was whether Government export credit insurance should be conducted through a statutory public corporation, as it is in some other countries, or by a Government Department. They came to the conclusion that this work should continue to be carried out by a Government Department—because of its use of public funds, its relation to the broader aspects of economic policy, and its dependence on information from Government sources. The Committee expressed the view that the highly-developed and comprehensive facilities enjoyed by British exporters had been administered wisely and with competence. They were, however, impressed by the increase in the weight of business transacted by the Department, which had expended tenfold since 1946. They recommended that in view of this expansion and of the importance of the Department to the export trade, an upgrading of its status in the hierarchy of Government Departments was necessary, and an increase in its senior cadre.

The Government have accepted these recommendations, and have decided to upgrade the head post in the Department, the title of which will be Secretary of the Export Credits Guarantee Department. They have taken the view that it would be advantageous if, for an initial period, this post could be filled by a man with practical experience in the City of London. They have, therefore, approached the Bank of England, who have agreed that Mr. L. J. Menzies, one of the Advisers to the Governors, should be seconded for this duty for a period of two to three years. Mr. Menzies will take up his new duties on October 6 and will be responsible directly to the President of the Board of Trade. Below him there will be two posts of Under Secretary. These will be filled by the appointment of Mr. A. E. Percival, of the Board of Trade, and Mr. A. T. K. Grant of the Treasury.

Electronic Computer Exhibition

The Electronic Computer Exhibition, the first of its kind in Europe, is to be held under the patronage of H.R.H. The Duke of Edinburgh at Olympia, London, from November 28 to December 4, 1958. Concurrently with the exhibition there will be held a Business Computer symposium. The exhibition and the symposium have been organized at the instigation of the National Research Development Corporation by the Electronic Engineering Association and the Office Appliance and Business Equipment Trades Association. The exhibition will be thoroughly representative of the British electronic computer industry and will show the outstanding contributions already made to the development and use of electronic computers and data-processing equipment.

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Personal

Mr. R. W. D. CARR has relinquished his directorships of John Dale, Limited, and its subsidiary companies.

Mr. RALPH GABRIEL has been appointed managing director of Charles Churchill & Company, Limited, the parent company of the Charles Churchill group.

Mr. RALPH CARR, a director of the Alston Foundry Company, Limited, Nent Force Foundry, Alston, Cumberland, has been appointed a Justice of the Peace.

Mr. A. G. VICKERS, milling machinist with Marshall, Sons & Company, Limited, engineers, Britannia Works, Gainsborough, retired recently after 48 years' service.

Mr. D. MACDOUGALD has been appointed general secretary of the British Institute of Management following the recent resignation of Mr. F. R. LIVOCK, the director.

Mr. L. HOLGATE, previously in charge of planning and rate-fixing at the south works factory of Leyland Motors, Limited, has been appointed chief time-study engineer (H.Q.) of the company.

Mr. C. N. JAQUES has been appointed Deputy Head of the Ministry of Supply Staff and Director, Guided Weapons and Electronics, at the British Joint Services Mission in Washington. He will take up his new duties in October.

Mr. ROBERT BOOTH, deputy secretary for the past nine years of Manchester Chamber of Commerce, left last week to become secretary of the Birmingham Chamber of Commerce. He takes up his new appointment on September 1.

Mr. C. PAYNE has been appointed secretary of Brookhirst Switchgear, Limited, one of the Metal Industries group of companies. He succeeds Mr. N. CLARK, who has been appointed administrative assistant to Mr. H. Owen Houchen, chief executive of the Brookhirst-Igranic organization.

Mr. DONALD P. SHEARER, B.ENG., ASSOC.ENG., for many years engineer to Radiation, Limited, has established himself in practice at 174, Walsall Road, Sutton Coldfield, Warwickshire, as a consultant, covering factory surveys, layouts, time study and production methods; advice in the field of vitreous enamelling, and foundry mechanization.

Mr. T. MORRISON has been appointed instrument sales manager for the UK of the Solatron Electronic Group, Limited. Mr. Morrison joined the Solatron Group in 1954 as a sales engineer and became field sales manager for the UK in July, 1957. Due to sales expansion, the group has decided to reorganize its sales areas into regional groups under Mr. DENNIS P. TAYLOR (south-western region), Mr. DAVID R. HALL (south-eastern region), and Mr. TERRY BLACKLOCK (north of England and Scotland).

Mr. KARL M. JONES, who has recently retired, had been for nearly 30 years with the Briton Ferry Steel Company, first as secretary, then as managing director, and latterly as joint managing director with Dr. J. R. RAIT, who succeeds him. He retains his seat on the board. Apart from his work in Briton Ferry, he had been concerned in the organization of the country's steel industry as district fuel representative for South Wales during the war, in three "scrap" drives, and as chairman of other internal committees.

Mr. E. G. KIMSEY, B.ENG., engineering contracts manager for Chamberlain Industries, Limited, Leyton, London, E.10, will be visiting the United States and Canada during the months of September and October to discuss the application of the "Staffa" slow-speed, high-torque, hydraulic motor which the company is now manufacturing. He will also be interested in discussing with companies the possibility of manufacturing American hydraulic equipment in the UK under licence, or alternatively entering into an agreement for sales distribution in the UK and sterling area.

Dr. M. F. JORDAN has joined Murex Welding Processes Limited, Waltham Cross, Herts., as leader of the fundamental-research section of the research department. In this capacity he succeeds Dr. W. D. BIGGS who has left to take up an appointment in the Engineering Department of Cambridge University Before joining Murex, Dr. Jordan was on the staff of the Aluminium Laboratories Limited, Banbury, for two and a half years and worked in the casting section of the company's metallurgy division. Mr. H J. WELLARD, B.SC., has also joined the Murex fundamental research team.

Obituary

The death is announced of Mr. HAROLD LINTOTT (86), former partner in the Horsham engineering works and foundry of H. & E. Lintott, Limited.

Mr. ALFRED IMESON, managing director of Imeson & Finch, Limited, electrical engineers, iron and non-ferrous founders, etc., of Stockton-on-Tees, has died at the age of 75.

Mr. CHARLES ARTHUR MORRIS, works manager of Allis-Chalmers Great Britain, Limited, agricultural engineers, of Essendine, near Stamford (Lincs), has died at the age of 52.

Mr. REGINALD PERCY JENKS, chairman of John Shaw & Sons, Wolverhampton, Limited, died on August 11. Mr. Jenks was also a director of the subsidiary companies of John Shaw & Sons—the British Tool & Engineering Company, Limited, Jenks Bros., Limited, John Shaw (Tools), Limited, and Moore & Wright (Sheffield), Limited.

The death is announced of Mr. ALBERT WILLIAM DAVIES, former works director of Mavor & Coulson, Limited, the Glasgow engineers and mining machinery manufacturers. He retired from the board of the company in 1948, but his services were retained in an advisory capacity until his death. Mr. Davies joined the company in 1896 after having served his apprenticeship in Staffordshire. In his early days with Mavor & Coulson he continued his technical education, and his promotion to leading hand was followed by appointments as foreman, shop manager, and, in 1920, as works director. He played an important part in the munitions work undertaken by his company during the first war, while he contributed largely to the development of underground mining machinery.

DEWRANCE & COMPANY, LIMITED—Sir Francis Evans and Mr. L. W. Cole have been appointed directors of the company, a subsidiary of Babcock & Wilcox, Limited. They fill vacancies on the board caused by the resignations of Admiral Sir Cecil Harcourt and Mr. H. McNeil.

HILLS (WEST BROMWICH), LIMITED—Mr. E. D. Hinchliffe has relinquished his appointments as deputy chairman and joint managing director. He remains a director of the company. Mr. H. Gaydon, hitherto joint managing director, has been appointed deputy chairman and sole managing director of the company.

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Company News

INDIAN IRON & STEEL COMPANY, LIMITED—An interim dividend of Rs. 1 per share, without deduction of tax on the doubled capital, is announced. There will be no further dividend for the year.

HALESOWEN STEEL COMPANY, LIMITED—In declaring an unchanged interim dividend of 4 per cent. for 1958, the board states that although trade for the first half of this year has been below expectations, it is hoped to pay the same 8 per cent. final dividend as last year on the £200,000 ordinary capital.

NORTH CENTRAL WAGON & FINANCE COMPANY, LIMITED—The offer by the National Provincial Bank to purchase the whole of the ordinary shares of the company is conditional upon acceptance on or before September 8 by holders of 90 per cent. in value (or such lesser percentage as may be notified), but the bank may extend the final date for acceptance to not later than October 31.

HILGER & WATTS, LIMITED, scientific instrument manufacturers, of London, S.E.5—In raising the interim dividend from 3 per cent. to 5 per cent., the directors state that it does not imply an increase in the total for the year ending September 30, 1958. Though trading results remain at a satisfactory level, they add that the effects of the present world economic situation may make the amount of future business uncertain. A total of 13 per cent. was paid on £300,000 for 1956-57, prior to the issue of 40,000 ordinary 5s. shares for the capital of Collimator Cases, Limited.

ALFRED HERBERT, LIMITED, machine-tool manufacturers, etc., of Coventry—The company is paying an interim of 2 per cent., free of tax, on capital increased to £10,923,750 by a one-for-one free scrip issue, equivalent to the previous 4 per cent. on old capital. The difficult conditions indicated in the chairman's annual statement last April continue, but the directors see no reason to alter their present view that the continuance of the present rate of dividend is amply justified—the total for the year to October 31, 1957, was 12 per cent., tax free, equivalent to 6 per cent. on the present capital.

A.B.C. COUPLER & ENGINEERING COMPANY, LIMITED—The company, control of which was acquired by Cranleigh Development in June, 1957, announces a dividend of 10 per cent. for the nine months to June 30, 1958, equal to an annual rate of 13⅓ per cent., which compares with the previous year's 20 per cent. Group profits for the period are £14,922 (£52,148), and are struck after tax of £19,860 (£65,901) and additional tax of £10,001 (nil) due to the change in accounting date, and after crediting £6,817 (nil) provisions written back. The holding company's net profit is £4,768 (£45,463).

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

FORMOSA, September 4—Woodworking machinery and hand tools, etc. (ESB/19736/58/ICA.)

INDIA, September 10—Mine car wheels and roller bearings. (ESB/19888/58.)

IRAN, September 6—Malleable cast iron. (ESB/19675/58.)

U.S.A.—Mr. W. Jacobson, of the Osco Corporation, 2906 East Colorado, Santa Monica, has told the British Consulate-General at Los Angeles that his firm would like to get in touch with UK manufacturers of grey-iron castings, weights 35-65 lbs. (ESB/19963/58.)

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 5s. 6d.)

795,982. Bochumer Verein fur Gussstahlfabrikation, A.G., Bochum, Germany.

The casting of steel or a steel-alloy under vacuum. The process is carried out under conditions such that the casting stream divides up into diverging parts. The extent of the divergence is controlled by introducing a gas, which can be inert, into the vacuum chamber—so long as the pressure does not increase to atmospheric. A window is fitted into the wall of the vacuum chamber so that an operator can see the casting stream and, therefore, control the flow of gas (see also Patent No. 796,369 (not abstracted)).

796,209. Hermann Sauter and Wilhelm Hahn, trading as Hahn and Kolb, Stuttgart, Germany.

Pressure-casting or die-casting machines of the type in which a mould carrier is movable either mechanically or hydraulically in its closed position with only slight force needed. This force is provided by a closing piston executing a relatively small stroke in its cylinder.

796,369. Bochumer Verein fur Gussstahlfabrikation A.G., Bochum, Germany.

Method of, and apparatus for, the introduction of gases and other substances into flowing streams of molten metal, especially steels. The invention provides for the use of a vacuum for the carrying out of the process.

796,467. Enn Vallak, 19, Avenue Beau Sejour, Geneva, Switzerland.

Improvements in hot tops for casting moulds. (See also Patent No. 731,324, FOUNDRY TRADE JOURNAL, July 21, 1955). The hot top consists of a number of inner ducts, channels or recesses which are, at least at one end, open to the air. These ducts, etc., are arranged so as to enable an air stream to be supplied to and through the inner portion of the hot-top material. At least one of the ducts is arranged for the supply of air, and at least one other duct being arranged for the escape of flue gases.

796,523. N.V. Industrie, V/H Van Lohingen & Company, Vaassen, The Netherlands.

Improvements in die-casting machines or high-precision moulding devices. In the invention the coupling means on these machines are arranged for relative actuation between coupled and released positions by driving means working independently of the process mechanism. Thus the coupling and uncoupling can be effected when the coupling means are in an unloaded condition.

796,733. Birmingham Small Arms Company, Limited, Armoury Road, Small Heath, Birmingham, 11.

Improvements in hardenable "ferritic" or martensitic chromium-alloy steels. (See also Patent Nos. 638,110; 658,115; 730,272 and 733,146.) This present invention provides means for maintaining hardenability whilst at the same time providing a comparatively high degree of creep strength.

796,781. William Jessop and Sons, Limited, Brightside Works, Sheffield, Yorks.

Alpha titanium alloys (hexagonal close-packed structure) with good creep resistance at 400 to 500 deg. C. and good forgeability.